Dura-Power Electric Models

DSE-5 THRU DSE-120 COMMERCIAL WATER HEATERS

• Installation • Operation • Maintenance • Checklist • Limited Warranty

CAUTION

TEXT PRINTED OR OUTLINED IN RED CONTAINS INFORMATION RELATIVE TO YOUR SAFETY. PLEASE READ THOROUGHLY BEFORE INSTALLING AND USING THIS APPLIANCE.

A.O.SMITH
WATER PRODUCTS COMPANY

A DIVISION OF A.O.SMITH CORPORATION
RENTON, WASHINGTON
www.hotwater.com

KEEP THIS MANUAL WITH THE HEATER FOR FUTURE REFERENCE.
WHENEVER MAINTENANCE ADJUSTMENTS OR SERVICE IS REQUIRED.

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SUPERSEDES PART NO. 60047-004 REV.5

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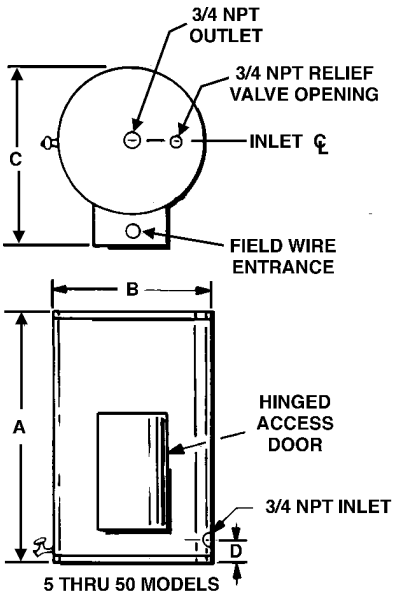
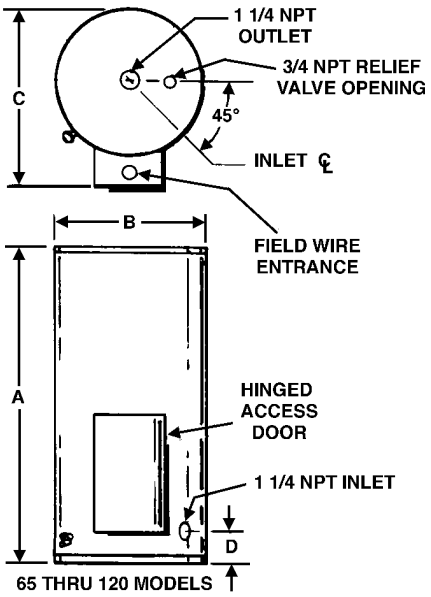
DIMENSIONS





Tank Capacity in Gallons	Maximum KW Input	All Dimensions in Inches				Approx. Ship Wt.Lbs.
		A	B	C	D	
5	3	20 /12	16 1/4	21 1/2	5 1/4	82
10	6	26 1/4	18 3/4	24	5 1/4	106
20	18	27 1/4	20 1/2	27	5 3/4	130
30	24	35 3/4	20 1/2	27	5 3/4	150
40	36	45 3/4	20 1/2	27	5 3/4	190
50	90	54 3/4	20 1/2	27	5 3/4	221
65	90	50 1/2	24 1/2	30 1/4	7	267
80	90	49 1/4	26 1/2	32 1/4	7	285
100	90	58 1/4	26 1/2	32 1/4	7	354
119	90	63 1/4	28	33 3/4	7 1/2	420

RECOVERY CAPACITY

RECOVERY RATE IN GALLONS PER HOUR *
Temperature Rise °F

STANDARD KW INPUT	BTU/ HOUR	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°
3	10,239	41	31	24	20	17	15	13	12	11	10	10	9
6	20,478	82	62	49	41	35	31	27	25	22	21	19	18
9	30,717	123	92	74	62	53	46	41	37	34	31	28	26
12	40,956	164	123	98	82	70	61	55	49	45	41	38	35
15	51,195	205	154	123	102	88	77	68	61	56	51	47	44
18	61,434	246	184	148	123	105	92	82	74	67	62	57	53
24	81,912	328	246	197	164	140	123	109	98	90	82	76	70
30	102,390	410	308	246	205	176	154	137	123	112	103	95	88
36	122,868	492	369	295	246	211	184	164	148	134	123	113	105
45	153,585	615	461	369	307	263	230	205	184	168	154	142	132
54	184,302	738	554	443	359	316	277	246	221	201	185	170	158
60**	204,780	819	615	492	410	351	307	273	246	223	205	189	176
75**	255,975	1025	768	615	512	439	384	341	307	279	256	236	219
90**	307,170	1229	922	738	615	527	461	410	369	335	307	284	263

* Figured at 1KW (3413 Btu) = 4.1 Gallons at 100°F temperature rise.
To determine recovery rate per minute, divide recovery rate per hour by 60.
NSF ratings may be obtained by multiplying above figures by 0.98.

**Available on 50 gallon models or larger.

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FOREWORD

Detailed installation diagrams are in this manual. These diagrams will serve to provide the installer with a reference for the materials and method of piping suggested. IT IS NECESSARY THAT ALL WATER PIPING AND THE ELECTRICAL WIRING BE INSTALLED AND CONNECTED AS SHOWN IN THE DIAGRAMS.

Particular attention should be given to the installation of thermometers at the locations indicated in the diagrams as these are necessary for checking the operation of the heater.

In addition to these instructions, the equipment shall be installed in accordance with those installation regulations in force in the local area where installation is to be made. Authorities having jurisdiction shall be consulted before installations are made. BE SURE TO TURN OFF POWER WHEN WORKING ON OR NEAR THE ELECTRICAL SYSTEM OF THE HEATER. NEVER TOUCH ELECTRICAL COMPONENTS WITH WET HANDS OR WHEN STANDING IN WATER. WHEN REPLACING FUSES ALWAYS USE THE CORRECT SIZE FOR THE CIRCUIT. SEE PAGE 14.

DO NOT TEST ELECTRICAL SYSTEM BEFORE HEATER IS FILLED WITH WATER, FOLLOW START UP PROCEDURE ON PAGE 17.

The principal components of the heater are identified on page 4. The model and rating plate on page 3 interprets certain markings into useful information. Both of these references should be used to identify the heater, its components and optional equipment.

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APPROVALS

All models bear the National Sanitation Foundation seal of approval.

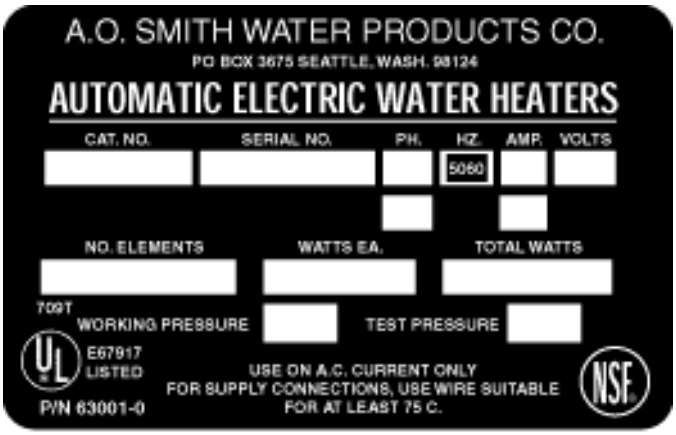
All models are listed by Underwriters' Laboratories, Inc.

ASME

125 PSI Working Pressure (65 thru 120 Gallons)

150 PSI Working Pressure (5 thru 50 Gallons)

MODEL & RATING PLATE



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GETTING TO KNOW YOUR WATER HEATER

Below is an illustration of the water heater with its features called out. The text of this manual will refer to the items shown.

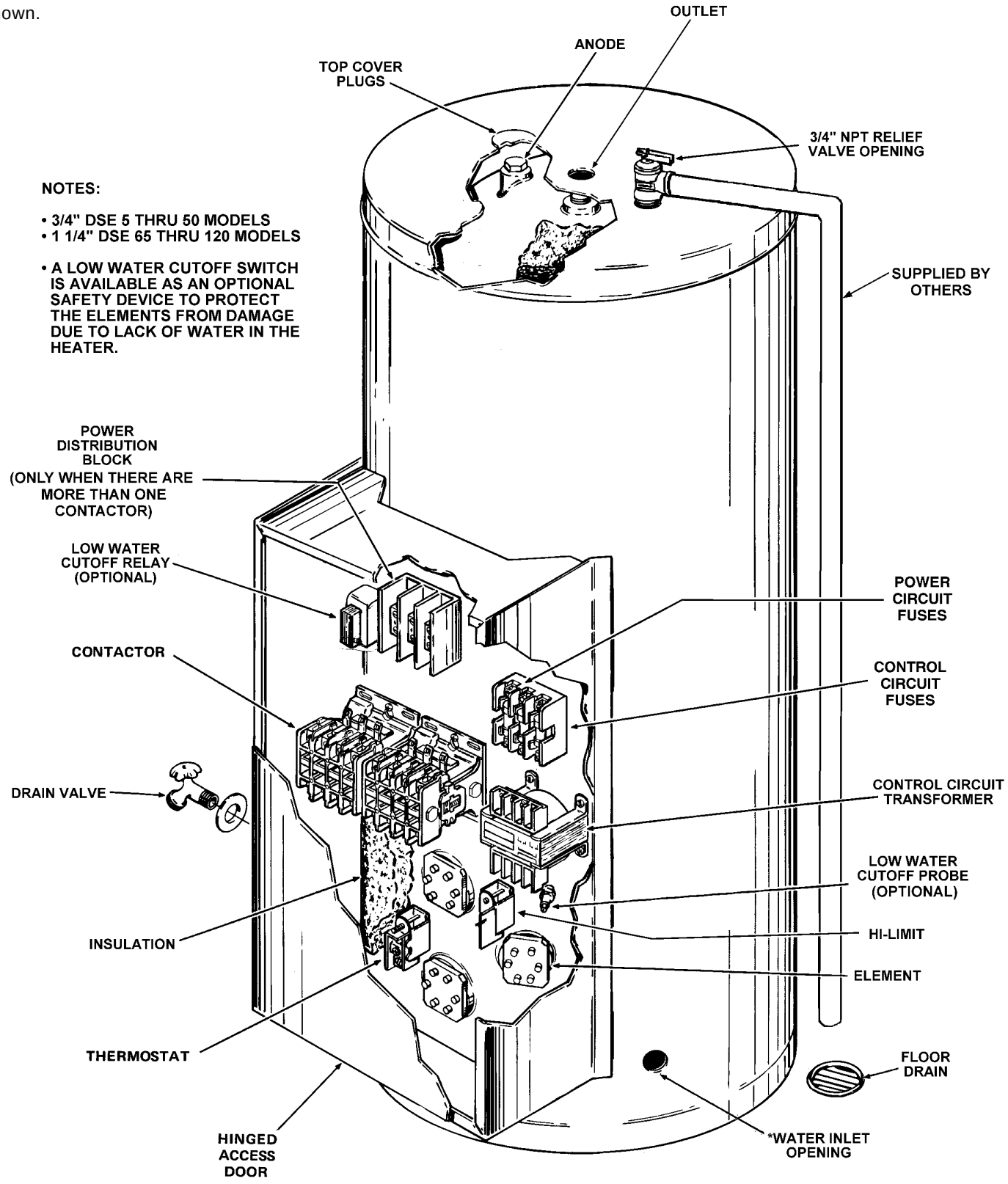
OUTLET
ANODE
TOP COVER PLUGS
3/4" NPT RELIEF VALVE OPENING
NOTES:
• 3/4" DSE 5 THRU 50 MODELS
• 1 1/4" DSE 65 THRU 120 MODELS
• A LOW WATER CUTOFF SWITCH IS AVAILABLE AS AN OPTIONAL SAFETY DEVICE TO PROTECT THE ELEMENTS FROM DAMAGE DUE TO LACK OF WATER IN THE HEATER.
SUPPLIED BY OTHERS
POWER DISTRIBUTION BLOCK (ONLY WHEN THERE ARE MORE THAN ONE CONTACTOR)
LOW WATER CUTOFF RELAY (OPTIONAL)
POWER CIRCUIT FUSES
CONTACTOR
CONTROL CIRCUIT FUSES
DRAIN VALVE
CONTROL CIRCUIT TRANSFORMER
LOW WATER CUTOFF PROBE (OPTIONAL)
INSULATION
HI-LIMIT
ELEMENT
THERMOSTAT
FLOOR DRAIN
HINGED ACCESS DOOR
*WATER INLET OPENING

FIGURE 1

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GENERAL SAFETY INFORMATION

INSULATION BLANKETS

Insulation blankets available to the general public for external use on electric water heaters are not approved for use on your A.O. Smith water heater. The purpose of an insulation blanket is to reduce the standby heat loss encountered with storage tank water heaters. Your A.O. Smith water heater meets or exceeds the National Appliance Energy Conservation Act standards with respect to insulation and standby loss requirements, making an insulation blanket unnecessary.

WARNING

Should you choose to apply an insulation blanket to this heater, you should follow these instructions (See Figure 1 for identification of components mentioned below). Failure to follow these instructions can result in fire, asphyxiation, serious personal injury or death.

1. DO NOT COVER THE JUNCTION BOX EXTERNAL WIRING, THERMOSTATS OR HEATING ELEMENTS ON ELECTRIC WATER HEATER.

2. DO NOT COVER THE TEMPERATURE-PRESSURE RELIEF VALVE.

3. DO NOT COVER OPERATING INSTRUCTIONS, INSTALLATION OR SAFETY RELATED LABELS.

.

4. DO OBTAIN NEW WARNING AND INSTRUCTION LABELS FROM A.O. SMITH FOR PLACEMENT ON THE BLANKET DIRECTLY OVER THE EXISTING LABELS.

5. WATER AND/OR CONDENSATE CAN COLLECT IN AN INSULATION BLANKET. A.O. SMITH WILL NOT BE LIABLE FOR ANY RUST OR CORROSION DAMAGE CAUSED BY THE INSTALLATION OF INSULATION BLANKETS.

WARNING

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

EXTERNAL DAMAGE

Do not operate the water heater until it has been fully checked out by a qualified service technician, if the water heater:

- Has been exposed to fire or damage.
- Produces steam or unusually hot water.

If the water heater has been subject to flooding, it must be replaced.

INSTALLATION

REQUIRED ABILITY

INSTALLATION OR SERVICE OF THIS WATER HEATER REQUIRES ABILITY EQUIVALENT TO THAT OF A LICENSED TRADESMAN IN THE FIELD INVOLVED. PLUMBING AND ELECTRICAL WORK INVOLVED.

GENERAL

The installation must conform to these instructions and the local code authority having jurisdiction. Grounding and electrical wiring connected to the water heater must also conform to the latest version of the NATIONAL ELECTRICAL CODE and NFPA-70. Copies of these codes may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.

If your location requires the installation of the water heater to comply with National Sanitation Foundation requirements, the heater must be sealed to the floor so as to prevent seepage underneath the heater. The following are recommended sealants that may be used on all types of flooring except concrete: GE Silicone Seal RTV-120, 103, 108 and 109.

DO NOT TEST ELECTRICAL SYSTEM BEFORE HEATER IS FILLED WITH WATER, FOLLOW START UP PROCEDURE AS WRITTEN IN “OPERATION” SECTION OF THIS MANUAL.

The principal components of the heater are identified in figure 1. The model and rating plate on page 3 interprets certain markings into useful information. Both of these references should be used to identify the heater, its components and optional equipment.

LOCATION

For proper installation, the heater should be installed on a level surface.

LOCATE IT NEAR A FLOOR DRAIN. THE HEATER SHOULD BE LOCATED IN AN AREA WHERE LEAKAGE FROM THE HEATER OR CONNECTIONS WILL NOT RESULT IN DAMAGE TO THE ADJACENT AREA OR TO LOWER FLOORS OF THE STRUCTURE.

WHEN SUCH LOCATIONS CANNOT BE AVOIDED, A SUITABLE DRAIN PAN SHOULD BE INSTALLED UNDER THE HEATER. Such pans should be fabricated with sides at least 2” deep, with length and width at least 2” greater than the diameter of the heater and must be piped to an adequate drain. Drain pans suitable for these heaters are available from your distributor or A.O. Smith Water Products Company, Product Service Division, 5621 W. 115th St., Alsip, IL 60803.

Locate the heater close to the point of major hot water usage and the power supply.

- Try to make hot water piping and branch circuit wiring as short as possible.

- Insulate hot and cold water piping where heat loss and condensation may be a problem.

THE HEATER SHOULD NOT BE LOCATED IN AN AREA WHERE IT WILL BE SUBJECT TO FREEZING.

Suggested clearances from adjacent surfaces are 18 inches in front for access to the controls and elements and 12 inches from top. The heater may be installed on or against combustible surfaces.

CONNECTIONS

The heater water inlet is located on the side of the heater near the bottom. The heater outlet is located at the top of the heater.

Piping and wiring diagrams are included in this manual.

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RELIEF DEVICES

An unplugged 3/4” relief valve opening is provided for installing temperature and pressure relief valve.

CAUTION: TO REDUCE THE RISK OF EXCESSIVE PRESSURES AND TEMPERATURE IN THIS WATER HEATER INSTALL TEMPERATURE AND PRESSURE PROTECTIVE EQUIPMENT REQUIRED BY LOCAL CODES but not less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for relief valve devices for hot water supply systems, ANSI Z21.22 (latest version).

This valve must be marked with a maximum set pressure not to exceed the marked maximum working pressure of the water heater. INSTALL THE VALVE INTO THE OPENING PROVIDED AND MARKED FOR THIS PURPOSE IN THE WATER HEATER, AND ORIENT IT OR PROVIDE TUBING SO THAT ANY DISCHARGE FROM THE VALVE WILL EXIT ONLY WITHIN 6 INCHES ABOVE, OR AT ANY DISTANCE BELOW THE STRUCTURAL FLOOR AND CANNOT CONTACT ANY LIVE ELECTRICAL PART. THIS DISCHARGE OPENING MUST NOT BE BLOCKED OR REDUCED IN SIZE UNDER ANY CIRCUMSTANCES.

The pressure setting of the relief valve should not exceed the pressure capacity of any component in the system. The temperature setting of the relief valve should not exceed 210°F.

TEMPERATURE LIMITING CONTROL

The heater control circuit contains a high temperature cutoff switch which operates if excessive water temperatures are reached. The high temperature cutoff contacts open at 190°F and must be manually reset (after a 30°F drop in water temperature). Disconnect the power before resetting button.

HYDROGEN GAS (FLAMMABLE)

CAUTION

HYDROGEN GAS CAN BE PRODUCED IN A HOT WATER SYSTEM SERVED BY THIS HEATER THAT HAS NOT BEEN USED FOR A LONG PERIOD OF TIME (GENERALLY TWO WEEKS OR MORE). HYDROGEN GAS IS EXTREMELY FLAMMABLE. To reduce the risk of injury under these conditions, it is recommended that the hot water faucet be opened for several minutes at the kitchen sink before using any electrical appliance connected to the hot water system. If hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. THERE SHOULD BE NO SMOKING OR OPEN FLAME NEAR THE FAUCET AT THE TIME IT IS OPEN.

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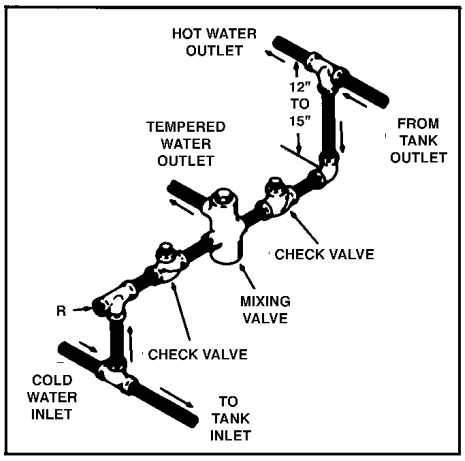
PIPING DIAGRAM

ONE OR TWO TEMPERATURE - ONE HEATER

MIXING VALVE APPLICATION FOR TWO TEMPERATURE SYSTEM

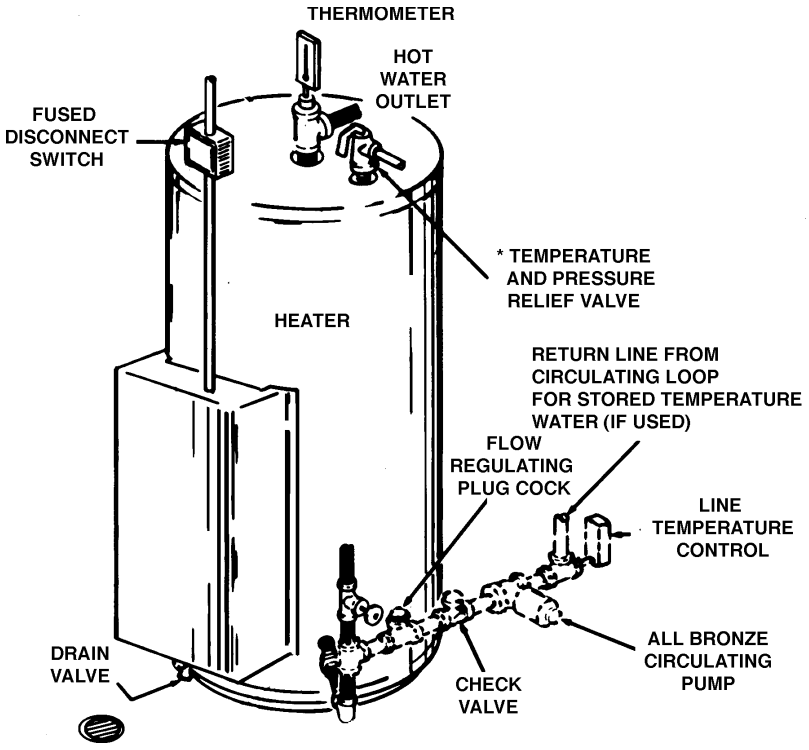


CIRCULATING RETURN LINE CONNECTIONS
- TEMPERED WATER LOOP, IF USED, CONNECT TO POINT R

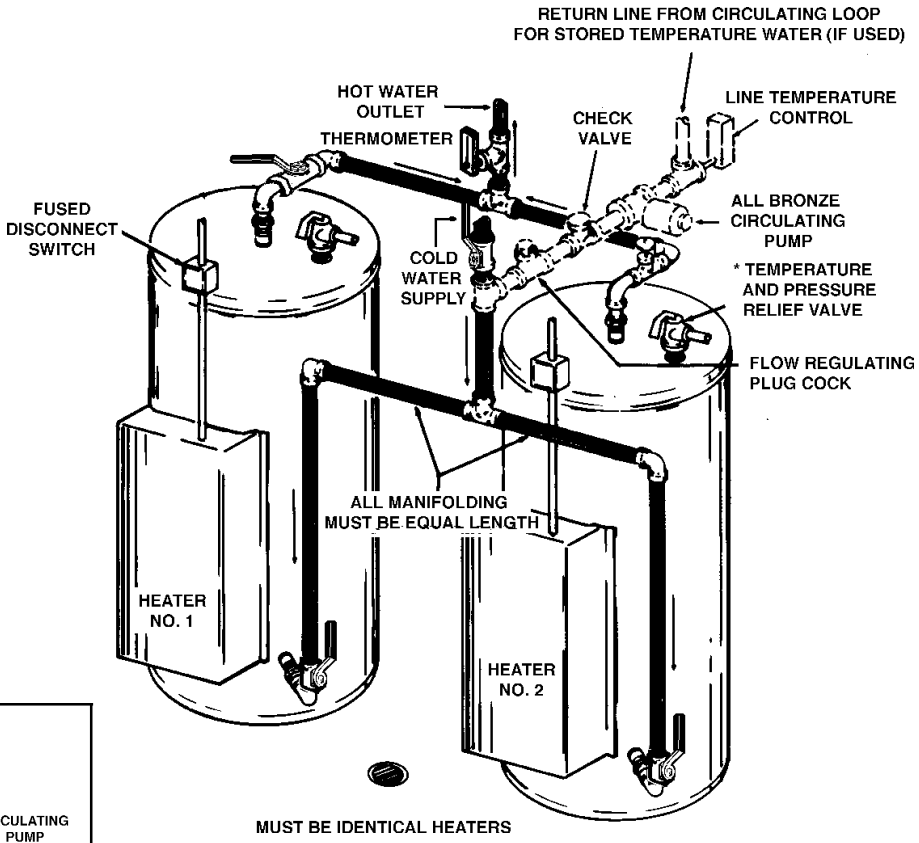
CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACK-FLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

*PIPE TO OPEN DRAIN.

INSTALL IN ACCORDANCE WITH ALL LOCAL CODES.



ONE OR TWO TEMPERATURE - TWO HEATER

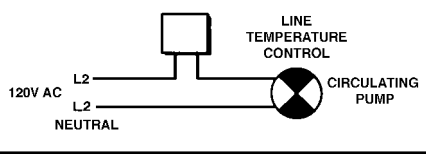

RETURN LINE FROM CIRCULATING LOOP FOR STORED TEMPERATURE WATER (IF USED)
HOT WATER OUTLET
THERMOMETER
CHECK VALVE
LINE TEMPERATURE CONTROL
FUSED DISCONNECT SWITCH
ALL BRONZE CIRCULATING PUMP
COLD WATER SUPPLY
* TEMPERATURE AND PRESSURE RELIEF VALVE
FLOW REGULATING PLUG COCK
ALL MANIFOLDING MUST BE EQUAL LENGTH
HEATER NO. 1
HEATER NO. 2

MUST BE IDENTICAL HEATERS

DANGER:

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE USE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGES 17 & 18. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES..

CIRCULATING PUMP WIRING DIAGRAM



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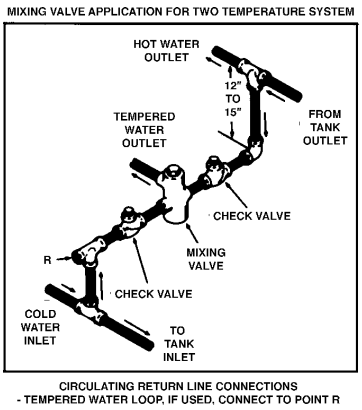
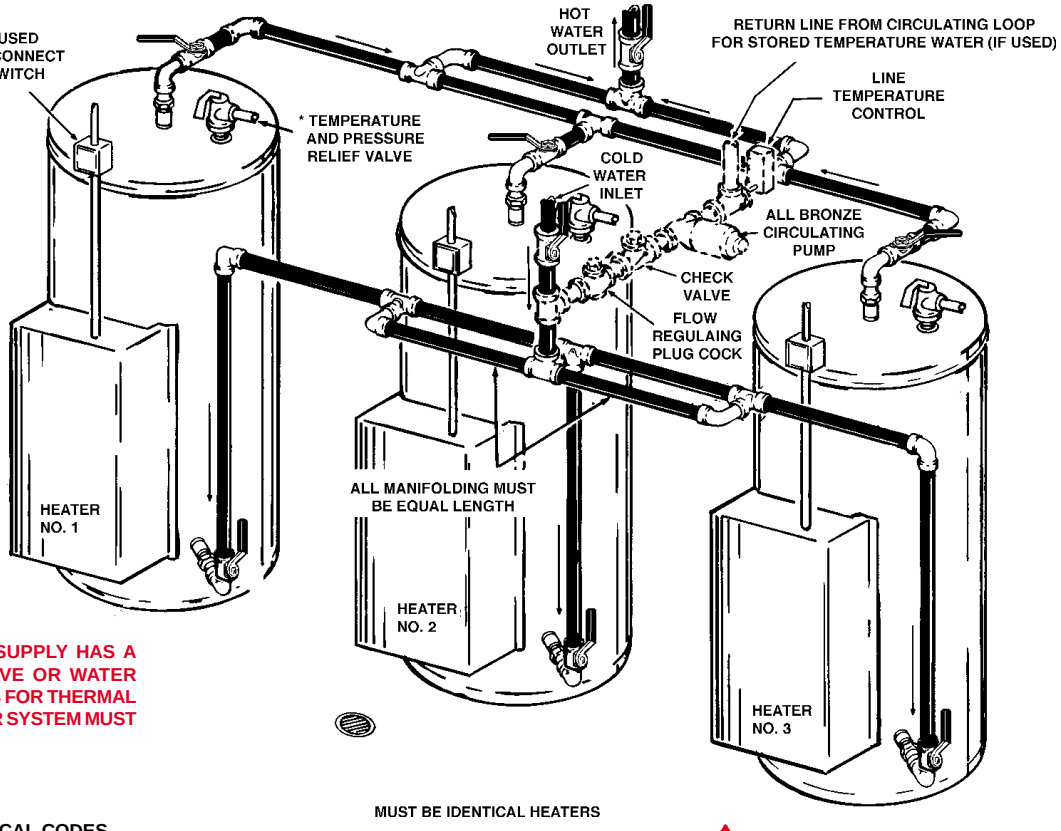
ONE OR TWO TEMPERATURE - THREE HEATERS



CIRCULATING RETURN LINE CONNECTIONS
- TEMPERED WATER LOOP, IF USED, CONNECT TO POINT R


FUSED DISCONNECT SWITCH
HOT WATER OUTLET
RETURN LINE FROM CIRCULATING LOOP FOR STORED TEMPERATURE WATER (IF USED)
LINE TEMPERATURE CONTROL
* TEMPERATURE AND PRESSURE RELIEF VALVE
COLD WATER INLET
ALL BRONZE CIRCULATING PUMP
CHECK VALVE
FLOW REGULAING PLUG COCK
ALL MANIFOLDING MUST BE EQUAL LENGTH
HEATER NO. 1
HEATER NO. 2
HEATER NO. 3

MUST BE IDENTICAL HEATERS

CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACK-FLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

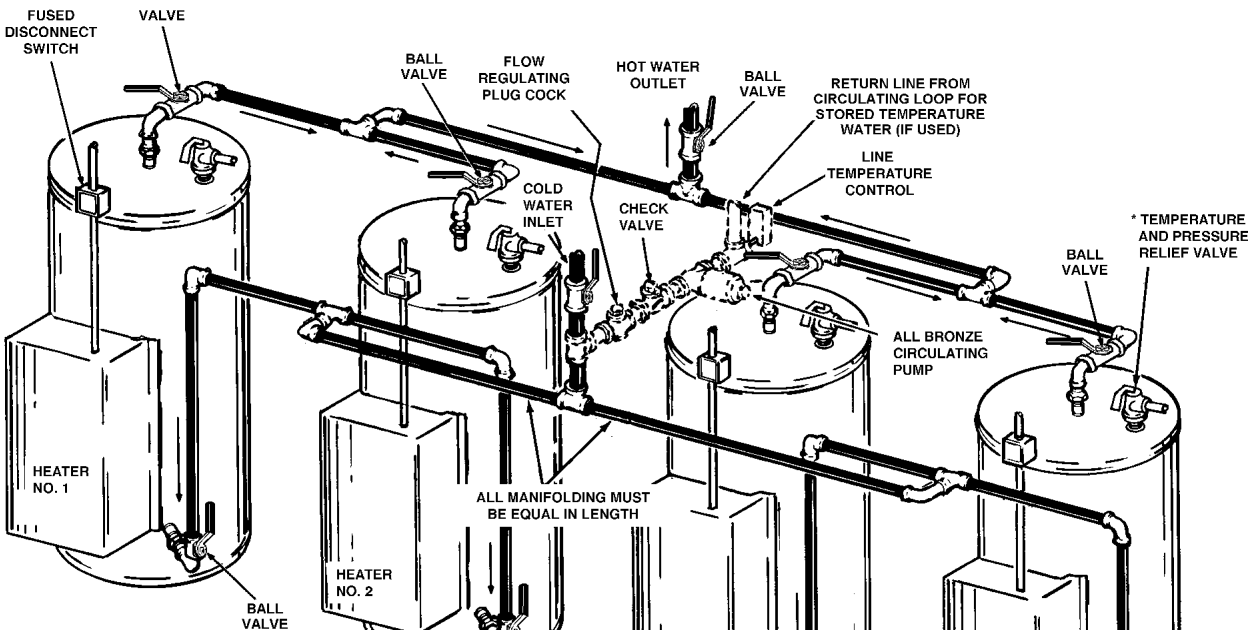
***PIPE TO OPEN DRAIN.**

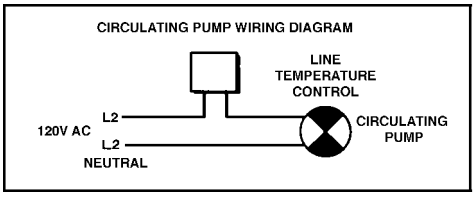
INSTALL IN ACCORDANCE WITH ALL LOCAL CODES.

DANGER:

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE USE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGES 17 & 18. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES..

ONE OR TWO TEMPERATURE - FOUR HEATERS





MUST BE IDENTICAL HEATERS

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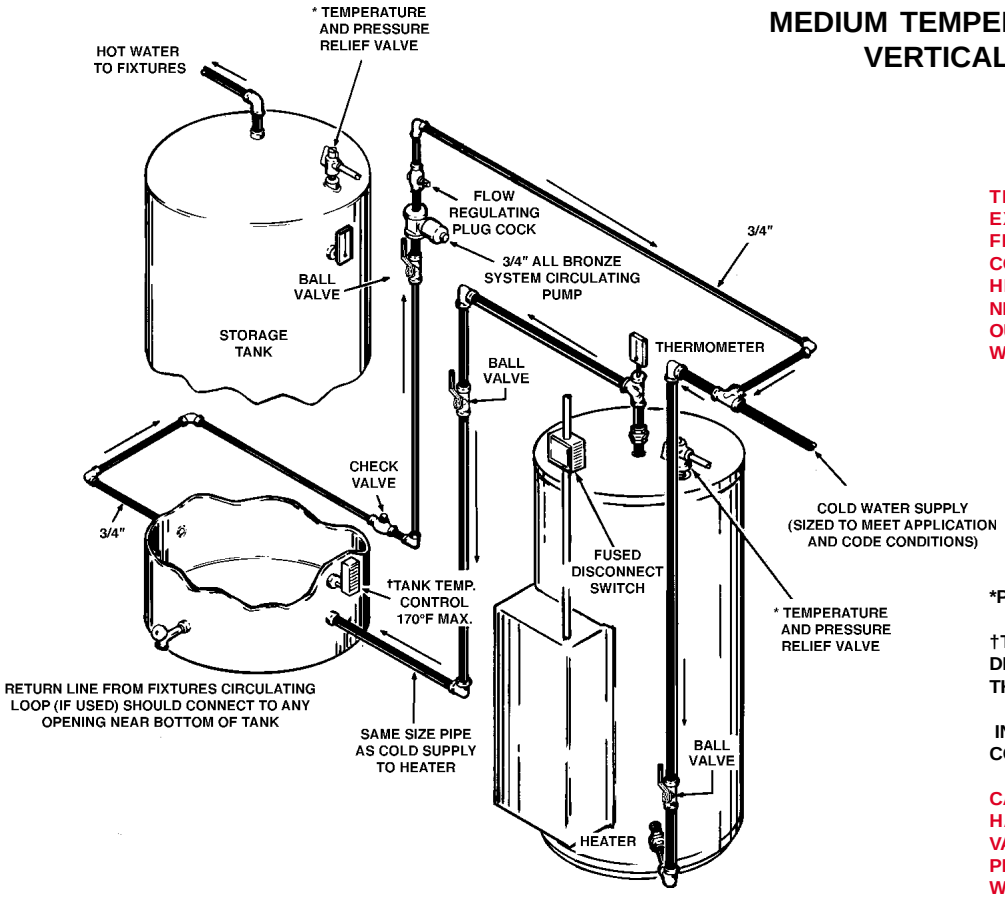
MEDIUM TEMPERATURE - ONE HEATER VERTICAL STORAGE TANK


* TEMPERATURE AND PRESSURE RELIEF VALVE
HOT WATER TO FIXTURES
FLOW REGULATING PLUG COCK
3/4" ALL BRONZE SYSTEM CIRCULATING PUMP
3/4"
BALL VALVE
STORAGE TANK
THERMOMETER
BALL VALVE
CHECK VALVE
3/4"
COLD WATER SUPPLY (SIZED TO MEET APPLICATION AND CODE CONDITIONS)
FUSED DISCONNECT SWITCH
†TANK TEMP. CONTROL 170°F MAX.
* TEMPERATURE AND PRESSURE RELIEF VALVE
RETURN LINE FROM FIXTURES CIRCULATING LOOP (IF USED) SHOULD CONNECT TO ANY OPENING NEAR BOTTOM OF TANK
SAME SIZE PIPE AS COLD SUPPLY TO HEATER
BALL VALVE
HEATER

DANGER:

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE USE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGES 17 & 18. IF HIGHER PREHEAT TEMPERATURES ARE NECCESARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES..

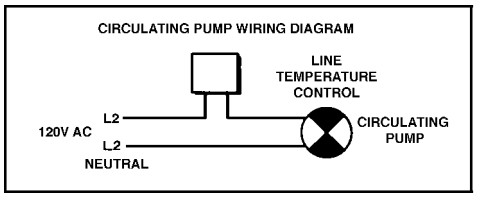
***PIPE RELIEF VALVE TO OPEN DRAIN.**

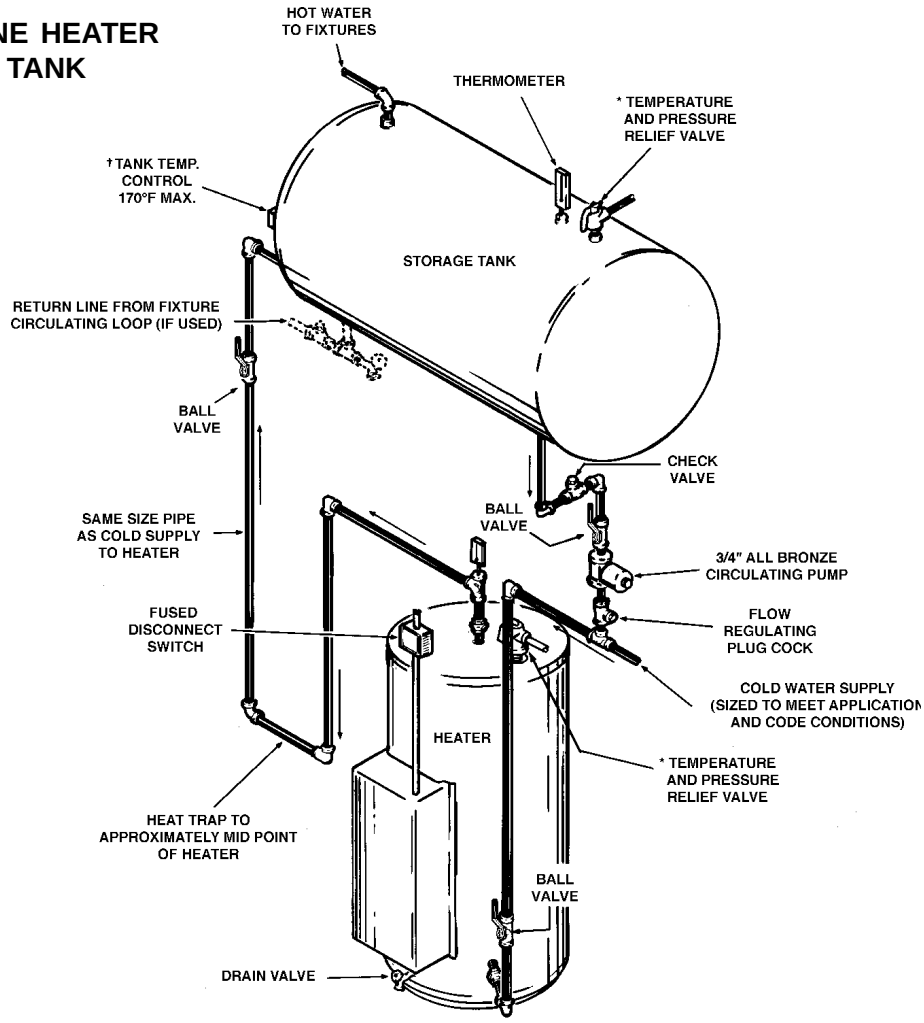
†TANK TEMPERATURE CONTROL SET AT DESIRED TEMPERATURE (MAX. 170°). HEATER THERMOSTAT SET AT LEAST 5° HIGHER.

INSTALL IN ACCORDANCE WITH ALL LOCAL CODES.

CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACK-FLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

MEDIUM TEMPERATURE - ONE HEATER HORIZONTAL STORAGE TANK




HOT WATER TO FIXTURES
THERMOMETER
* TEMPERATURE AND PRESSURE RELIEF VALVE
†TANK TEMP. CONTROL 170°F MAX.
STORAGE TANK
RETURN LINE FROM FIXTURE CIRCULATING LOOP (IF USED)
BALL VALVE
CHECK VALVE
SAME SIZE PIPE AS COLD SUPPLY TO HEATER
BALL VALVE
3/4" ALL BRONZE CIRCULATING PUMP
FUSED DISCONNECT SWITCH
FLOW REGULATING PLUG COCK
COLD WATER SUPPLY (SIZED TO MEET APPLICATION AND CODE CONDITIONS)
HEATER
* TEMPERATURE AND PRESSURE RELIEF VALVE
HEAT TRAP TO APPROXIMATELY MID POINT OF HEATER
BALL VALVE
DRAIN VALVE

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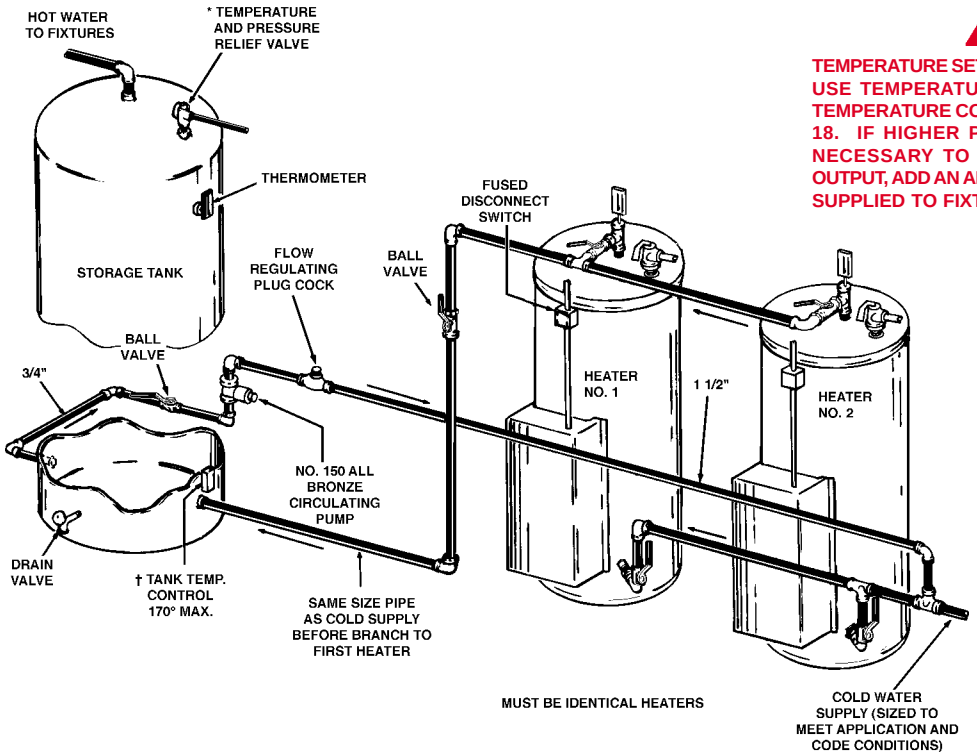
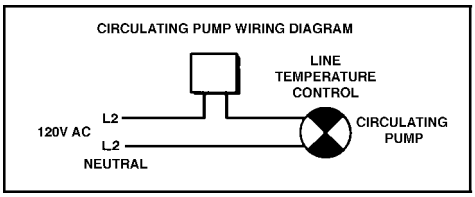
MEDIUM TEMPERATURE - TWO HEATERS VERTICAL STORAGE TANK


HOT WATER TO FIXTURES
* TEMPERATURE AND PRESSURE RELIEF VALVE
THERMOMETER
FUSED DISCONNECT SWITCH
STORAGE TANK
FLOW REGULATING PLUG COCK
BALL VALVE
BALL VALVE
3/4"
HEATER NO. 1
1 1/2"
HEATER NO. 2
NO. 150 ALL BRONZE CIRCULATING PUMP
DRAIN VALVE
† TANK TEMP. CONTROL 170° MAX.
SAME SIZE PIPE AS COLD SUPPLY BEFORE BRANCH TO FIRST HEATER
MUST BE IDENTICAL HEATERS
COLD WATER SUPPLY (SIZED TO MEET APPLICATION AND CODE CONDITIONS)

DANGER:

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE USE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGES 17 & 18. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES..

MEDIUM TEMPERATURE - TWO HEATERS HORIZONTAL STORAGE TANK



RETURN LINE FROM FIXTURE CIRCULATING LOOP (IF USED) SHOULD CONNECT TO ANY OPENING NEAR BOTTOM OF TANK.

*** PIPE RELIEF VALVE TO OPEN DRAIN.**

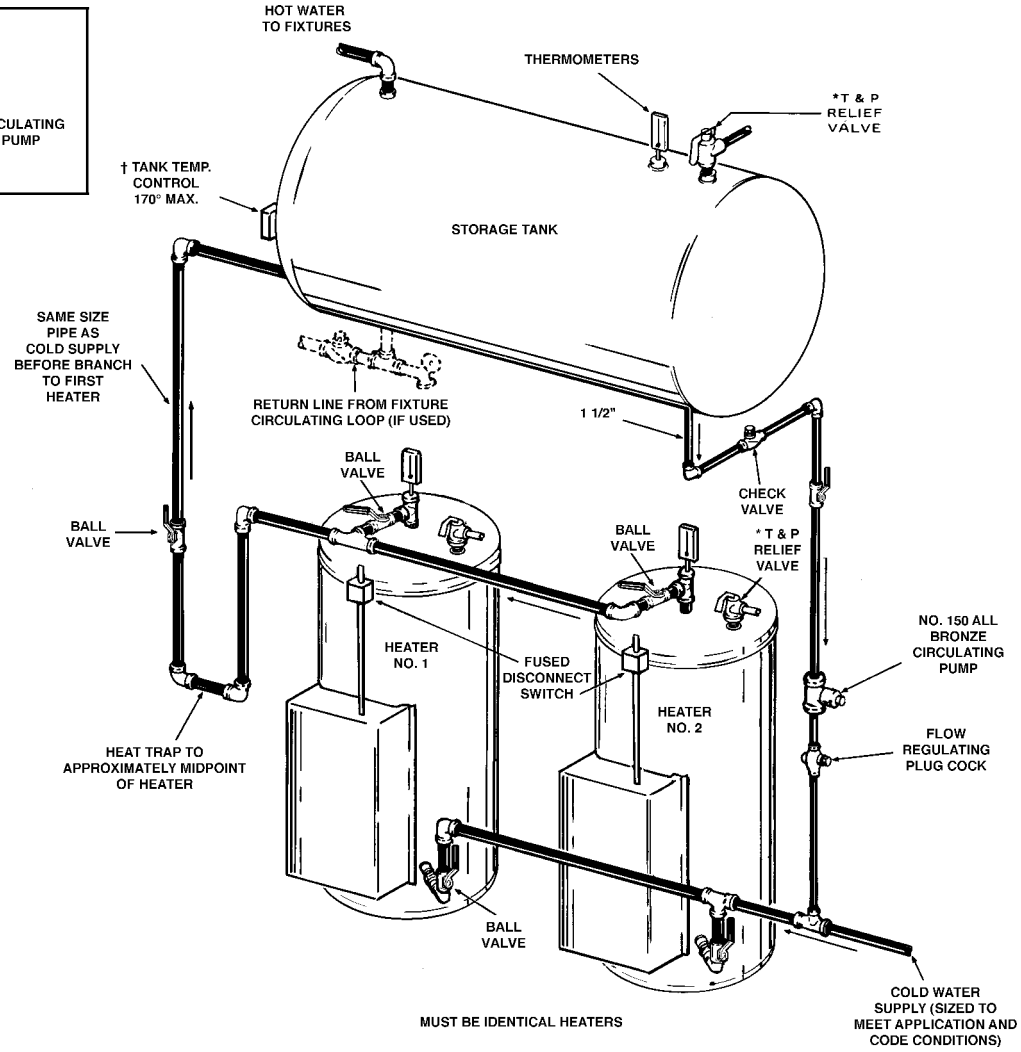
† TANK TEMPERATURE CONTROL SET AT DESIRED TEMPERATURE (MAX. 170°). HEATER THERMOSTAT SET AT LEAST 5° HIGHER.

INSTALL IN ACCORDANCE WITH ALL LOCAL CODES.

CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACK-FLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

NOTE:
BRANCH PIPING TO ALL HEATERS MUST BE SAME SIZE AND LENGTH FOR EQUAL FLOW. THESE BRANCHES MAY BE SIZED UP TO 1 1/4" SO THAT CROSS SECTIONAL AREAS OF ALL INLETS AND OUTLETS AT LEAST EQUAL AREA OF THEIR RESPECTIVE MAIN PIPING.

REVERSE RETURN PIPING SHOWN.


HOT WATER TO FIXTURES
THERMOMETERS
*T & P RELIEF VALVE
† TANK TEMP. CONTROL 170° MAX.
STORAGE TANK
SAME SIZE PIPE AS COLD SUPPLY BEFORE BRANCH TO FIRST HEATER
RETURN LINE FROM FIXTURE CIRCULATING LOOP (IF USED)
1 1/2"
BALL VALVE
CHECK VALVE
BALL VALVE
BALL VALVE
*T & P RELIEF VALVE
HEATER NO. 1
FUSED DISCONNECT SWITCH
HEATER NO. 2
NO. 150 ALL BRONZE CIRCULATING PUMP
FLOW REGULATING PLUG COCK
HEAT TRAP TO APPROXIMATELY MIDPOINT OF HEATER
BALL VALVE
MUST BE IDENTICAL HEATERS
COLD WATER SUPPLY (SIZED TO MEET APPLICATION AND CODE CONDITIONS)

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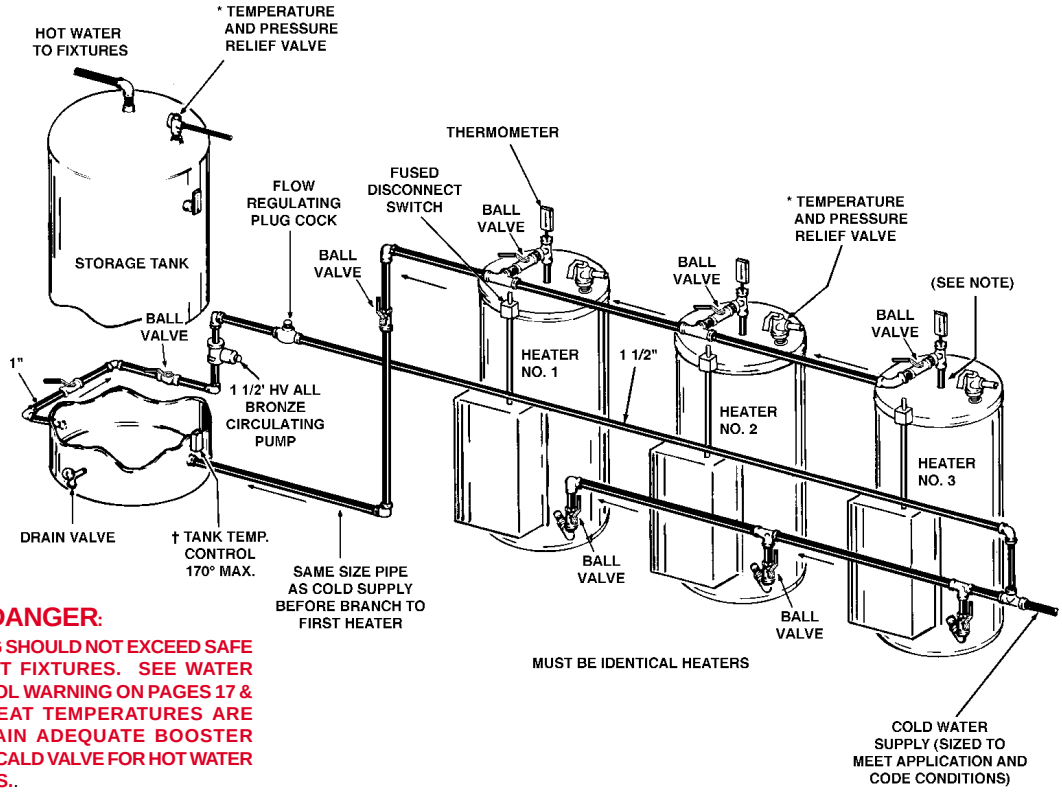
MEDIUM TEMPERATURE - THREE HEATERS VERTICAL STORAGE TANK



DANGER:

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE USE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGES 17 & 18. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES..

MEDIUM TEMPERATURE - THREE HEATERS HORIZONTAL STORAGE TANK

*** PIPE RELIEF VALVE TO OPEN DRAIN**

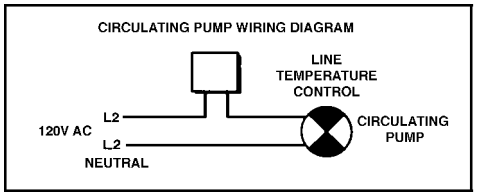
† TANK TEMPERATURE CONTROL SET AT DESIRED TEMPERATURE (MAX. 170°). HEATER THERMOSTAT SET AT LEAST 5° HIGHER.

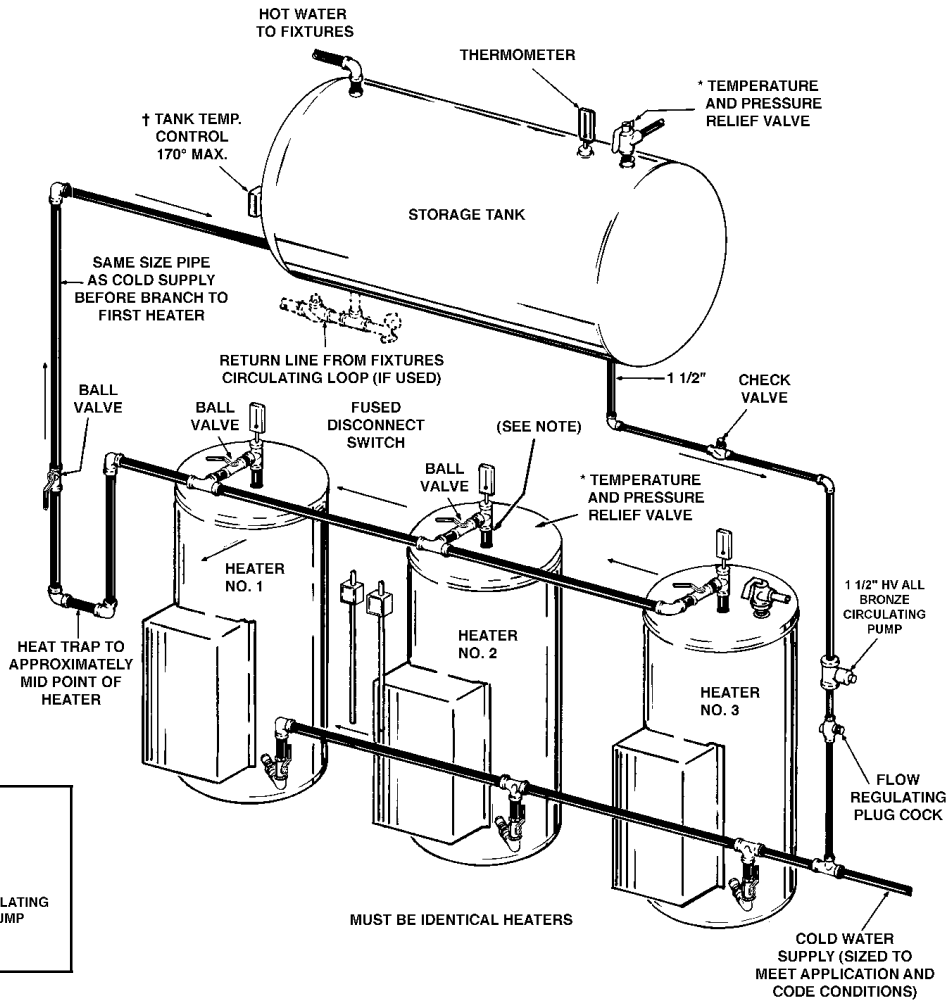
CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACK-FLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

INSTALL IN ACCORDANCE WITH ALL LOCAL CODES.

NOTE:
BRANCH PIPING TO ALL HEATERS MUST BE SAME SIZE AND LENGTH FOR EQUAL FLOW. THESE BRANCHES MAY BE SIZED UP TO 1 1/4" SO THAT CROSS SECTIONAL AREAS OF ALL INLETS AND OUTLETS AT LEAST EQUAL AREA OF THEIR RESPECTIVE MAIN PIPING.

REVERSE RETURN PIPING SHOWN.




HOT WATER TO FIXTURES
THERMOMETER
* TEMPERATURE AND PRESSURE RELIEF VALVE
† TANK TEMP. CONTROL 170° MAX.
STORAGE TANK
SAME SIZE PIPE AS COLD SUPPLY BEFORE BRANCH TO FIRST HEATER
RETURN LINE FROM FIXTURES CIRCULATING LOOP (IF USED)
1 1/2"
CHECK VALVE
BALL VALVE
BALL VALVE
FUSED DISCONNECT SWITCH
(SEE NOTE)
BALL VALVE
* TEMPERATURE AND PRESSURE RELIEF VALVE
HEATER NO. 1
1 1/2" HV ALL BRONZE CIRCULATING PUMP
HEATER NO. 2
HEATER NO. 3
HEAT TRAP TO APPROXIMATELY MID POINT OF HEATER
FLOW REGULATING PLUG COCK
MUST BE IDENTICAL HEATERS
COLD WATER SUPPLY (SIZED TO MEET APPLICATION AND CODE CONDITIONS)

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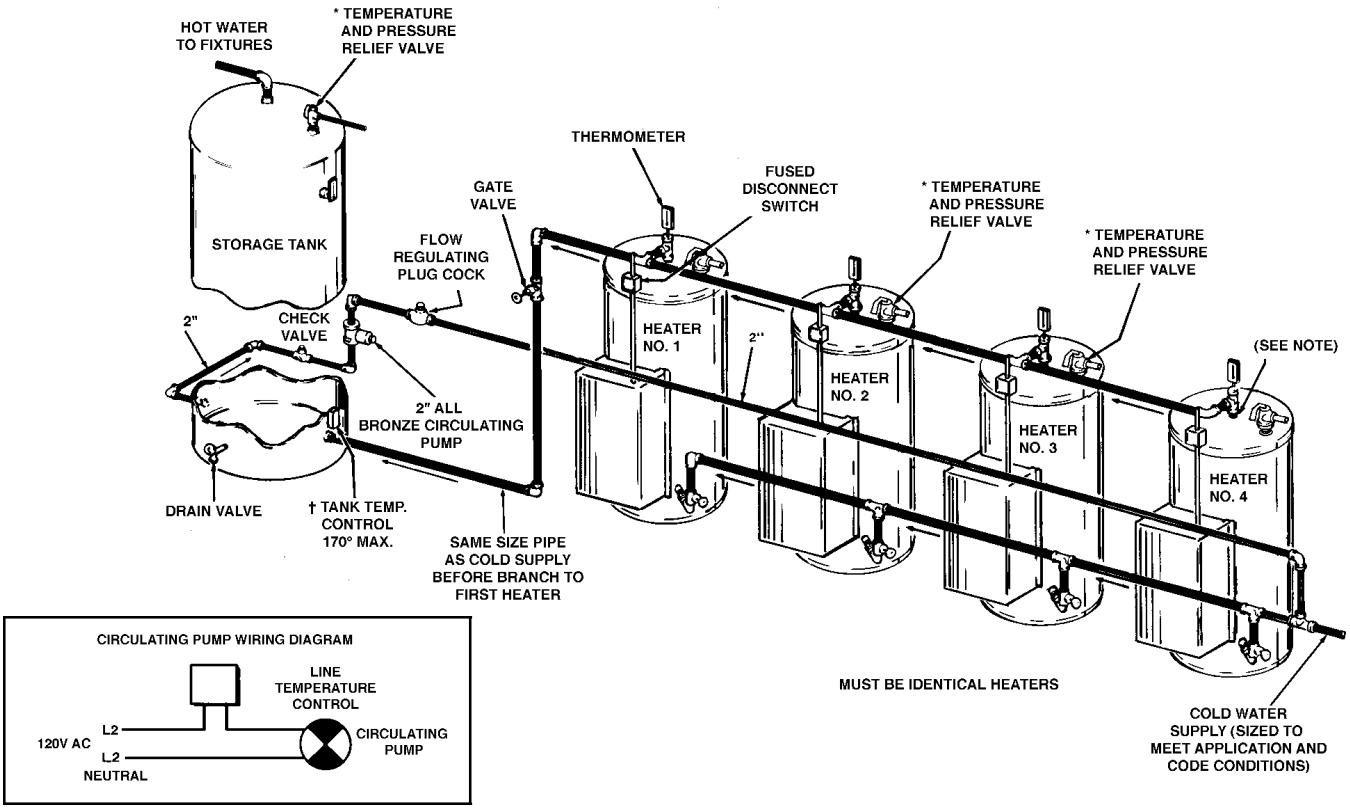
MEDIUM TEMPERATURE - FOUR HEATERS VERTICAL STORAGE TANK



MEDIUM TEMPERATURE - FOUR HEATERS HORIZONTAL STORAGE TANK

CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACK-FLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

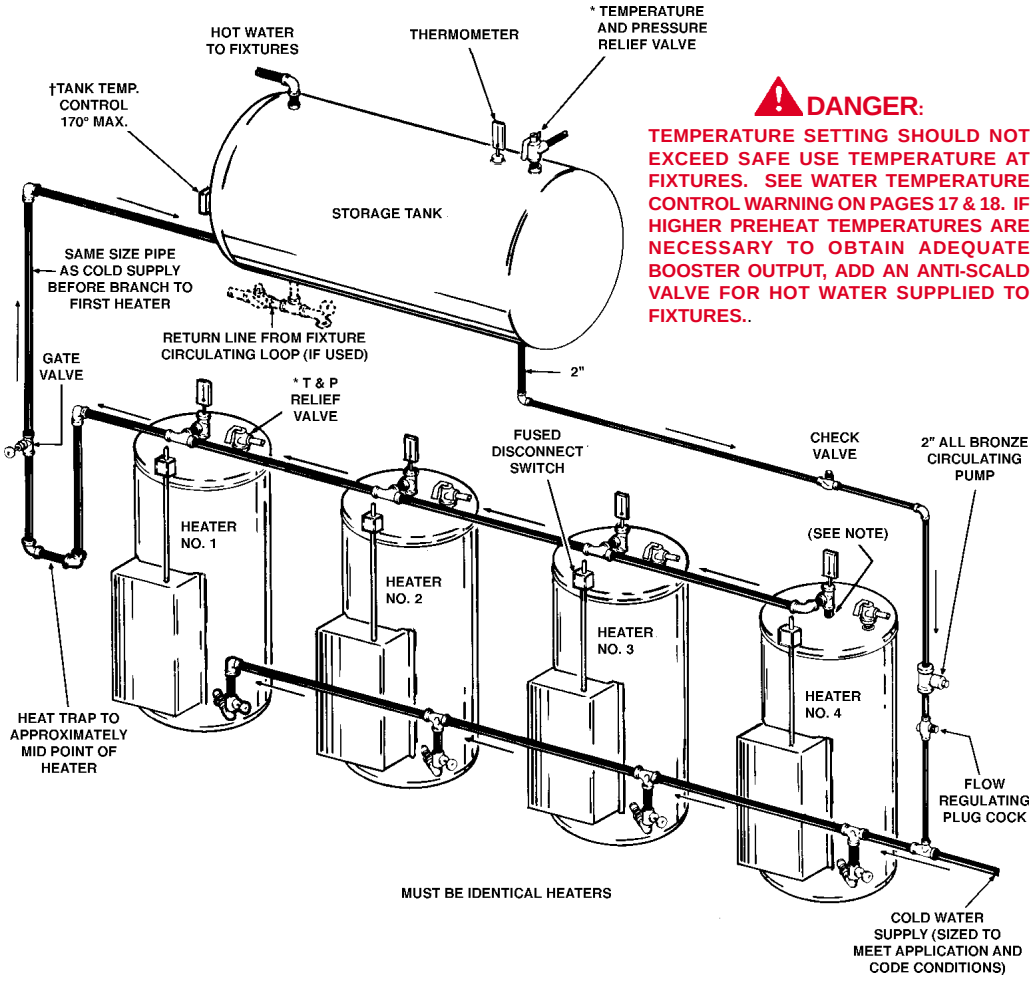
*** PIPE RELIEF VALVE TO OPEN DRAIN.**

† TANK TEMPERATURE CONTROL SET AT DESIRED TEMPERATURE (MAX. 170°). HEATER THERMOSTAT SET AT LEAST 5° HIGHER.

INSTALL IN ACCORDANCE WITH ALL LOCAL CODES.

NOTE:
BRANCH PIPING TO ALL HEATERS MUST BE SAME SIZE AND LENGTH FOR EQUAL FLOW. THESE BRANCHES MAY BE SIZED UP TO 1 1/4" SO THAT CROSS SECTIONAL AREAS OF ALL INLETS AND OUTLETS AT LEAST EQUAL AREA OF THEIR RESPECTIVE MAIN PIPING.

REVERSE RETURN PIPING SHOWN.


HOT WATER TO FIXTURES
THERMOMETER
* TEMPERATURE AND PRESSURE RELIEF VALVE
†TANK TEMP. CONTROL 170° MAX.
STORAGE TANK
SAME SIZE PIPE AS COLD SUPPLY BEFORE BRANCH TO FIRST HEATER
RETURN LINE FROM FIXTURE CIRCULATING LOOP (IF USED)
2"
GATE VALVE
* T & P RELIEF VALVE
FUSED DISCONNECT SWITCH
CHECK VALVE
2" ALL BRONZE CIRCULATING PUMP
HEATER NO. 1
HEATER NO. 2
(SEE NOTE)
HEATER NO. 3
HEATER NO. 4
HEAT TRAP TO APPROXIMATELY MID POINT OF HEATER
FLOW REGULATING PLUG COCK
MUST BE IDENTICAL HEATERS
COLD WATER SUPPLY (SIZED TO MEET APPLICATION AND CODE CONDITIONS)

DANGER:

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE USE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGES 17 & 18. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES..

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ELECTRICAL

GENERAL

The installation must conform to these instructions, the local code authority having jurisdiction, and the requirements of the power company. In the absence of code requirements follow the latest version of NFPA-70, The National Electrical Code which may be ordered from: American National Standards Institute, 1430 Broadway, New York, NY 10018.

WARNING

AN ELECTRICAL GROUND IS REQUIRED TO REDUCE RISK OF ELECTRIC SHOCK OR POSSIBLE ELECTROCUTION. The water heater should be connected to a separate, grounded, branch circuit with overcurrent protection and disconnect switch. The water heater should be grounded in accordance with national and local codes.

Check the heater model and rating plate information against the characteristics of the branch circuit electrical supply. DO NOT CONNECT THE HEATER TO AN IMPROPER SOURCE OF ELECTRICITY.

Voltage applied to the heater should not vary more than +5% to -10% of the model and rating plate marking for satisfactory operation.

DO NOT ENERGIZE THE BRANCH CIRCUIT FOR ANY REASON BEFORE THE HEATER TANK IS FILLED WITH WATER. DOING SO WILL CAUSE THE HEATING ELEMENT TO BURN OUT.

The branch circuit is connected to the heater wiring through an opening provided on the heater.

BRANCH CIRCUIT

The branch circuit wire and fuse size should be established through reference to the latest version of the National Electrical Code or other locally approved source in conjunction with the heater amperage rating. Branch circuit wires should be 75°C temperature rated. For convenience, portions of the wire size tables from the Code are reproduced here. It is suggested the electrician size the branch circuit at 125 percent of the heater ampere rating and further increase wire size as necessary to compensate for voltage drop in long runs. Branch circuit voltage drop should not exceed 3% at the heater.

TABLE 310-16. Allowable Ampacities of Insulated Conductors

Not More Than Three Conductors in Raceway or Cable or Earth
(Directly Buried), Based on Ambient Temperature of 30°C (86°F)

Size	Temperature Rating of Conductor, See table 310-13								Size
	60°C (140°F)	75°C (167°F)	85°C (185°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	85°C (185°F)	90°C (194°F)	
AWG MCM	TYPES RUW, T TW, UF	TYPES FEPW RH,RHW RUH, THW, THWN, XHHW USE, ZW	TYPES V, MI	TYPES TA, TBS SA, AVB SIS, =FEP, =FEPB, =RHH, =THHN, =XHHW*	TYPES RUW, T TW, UF	TYPES RH, RHW RUH THW, THWN XHHW, USE	TYPES V, MI	TYPES TA, TBS, SA, AVB SIS, =RHH, =THHN, =XHHW*	AWG MCM
	COPPER				ALUMINUM OR COPPER-CLAD ALUMINUM				
18	.....	.....	.....	21	.....	.....	.....	.....	.....
16	.....	.....	22	22	.....	.....	.....	.....	.....
14	15	15	25	25	.....	.....	.....	.....	.....
12	20	20	30	30	15	15	25	25	12
10	30	30	40	40	25	25	30	30	10
8	40	45	50	50	30	40	40	40	8
6	55	65	70	70	40	50	55	55	6
4	70	85	90	90	55	65	70	70	4
3	80	100	105	105	65	75	80	80	3
2		115	120	120	75	90	95	95	2
1		130	140	140		100	110	110	1
0		150	155	155		120	125	125	0
00		175	185	185		135	145	145	00
000		200	210	210		155	165	165	000
0000		230	235	235		180	185	185	0000
250		255	270	270		205	215	215	250
300		285	300	300		230	240	240	300
350		310	325	325		250	260	260	350
400		335	360	360		270	290	290	400
500		380	405	405		310	330	330	500

CORRECTION FACTORS

Ambient Temp.°C	For ambient temperatures over 30°C, multiply the amacities shown by the appropriate correction factor to determine the maximum allowable load current.								Ambient Temp.°F
31-40	.82	.88	.90	.91	.82	.88	.90	.91	86-104
41-50	.58	.75	.80	.82	.58	.75	.80	.82	105-122
51-60	.....	.58	.67	.71	.....	.58	.67	.71	123-141
61-70	.....	.35	.52	.58	.....	.35	.52	.58	142-158
71-80	.....	.....	.30	.41	.....	.....	.30	.41	159-176

= The load current rating and the overcurrent protection for these conductors shall not exceed 15 amperes for 14 AWG, 20 amperes for 12 AWG, and 30 amperes for 10 AWG copper; or 15 amperes for 12 AWG and 25 amperes for 10 AWG aluminum and copper-clad aluminum.

* For dry locations only. See 75°C column for wet locations.

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AMPERAGE TABLE/OVERCURRENT PROTECTION

This table provides the total connected heating element load in amperes for branch circuit conductor and over current protection sizing. Single-phase heaters are two wire circuits. Three-phase heaters are three wire circuits. In addition to the foregoing a ground conductor may be required.

The rating of the overcurrent protection should be computed on the basis of 125 percent of the total connected load amperage. Where the standard ratings and settings do not correspond with this computation, the next higher standard rating or setting should be selected.

HEATER CIRCUITS

The water heater's electrical components are pictured and identified in Figure 1.

The following describes the heater circuits and includes wiring diagrams. All heater circuits are designed for 60 hertz alternating current.

CONTROL CIRCUIT

The heater is equipped with 120 volt control circuit where all of the heating elements are switched on and off together. This is the standard circuit and may be used with up to five elements.

The control circuit wiring is 14 AWG rated 600 volts, 105°C.

A low water cutoff switch is available as an optional safety device to protect the elements from damage due to lack of water in the heater.

POWER CIRCUIT

Power circuit wiring is rated 600 volts, 75°C.

WIRING DIAGRAMS

The following wiring diagrams are included in this manual to show typical arrangement of electrical components in the control and power circuits by voltage and phase characteristics. They are to be used as a reference by the installer or servicer in performing their work. An actual diagram of the water heater wiring is furnished with the heater.

STANDARD KW INPUTS

Standard KW Ratings	Immersion Heaters***		Number of 50A Contractors			Full Load Current In Amperes						
						Single Phase				Three Phase		
	No. Of	Wattage	208V	240V	480V	208V	240V	277V	480V	208V	240V	480V
3	1	3,000				14.4	12.5	10.8	6.3	8.3	7.2	3.6
6	1	6,000	1			28.8	25.0	21.2	12.5	16.7	14.4	7.2
9	1	9,000		1		43.3	37.5	32.5	18.8	25.0	21.7	10.8
12	1	12,000			1	57.7	50.0	43.3	25.0	33.3	28.9	14.4
15	1	15,000				72.1	62.5	54.2	31.3	41.6	36.1	18.0
18*	1	18,000				86.5	75.0	65.0	37.5	50.0	43.3	21.7
24	2	12,000	2			115.4	100.0	86.6	50.0	66.6	57.7	28.9
30	2	15,000		2		144.2	125.0	108.3	62.5	83.3	72.2	36.1
36*	2	18,000				173.1	150.0	130.0	75.0	99.9	86.6	43.3
45	3	15,000	3	3		216.3	187.5	162.5	93.8	124.9	108.3	54.1
54	3	18,000			2	N/A	225.0	194.9	112.5	149.9	129.9	65.0
60**	4	15,000	4	4		N/A	250.0	216.6	125	166.7	145	72
75**	5	18,000	5	5	3	N/A	312.5	270.8	156	208.4	181	90
90**	5	18,000				N/A	375.0	324.9	188	250	217	108

* 208V models use one additional immersion heater.
** Available on 50 gallon models or larger.
***Each immersion heater contains three electric elements.

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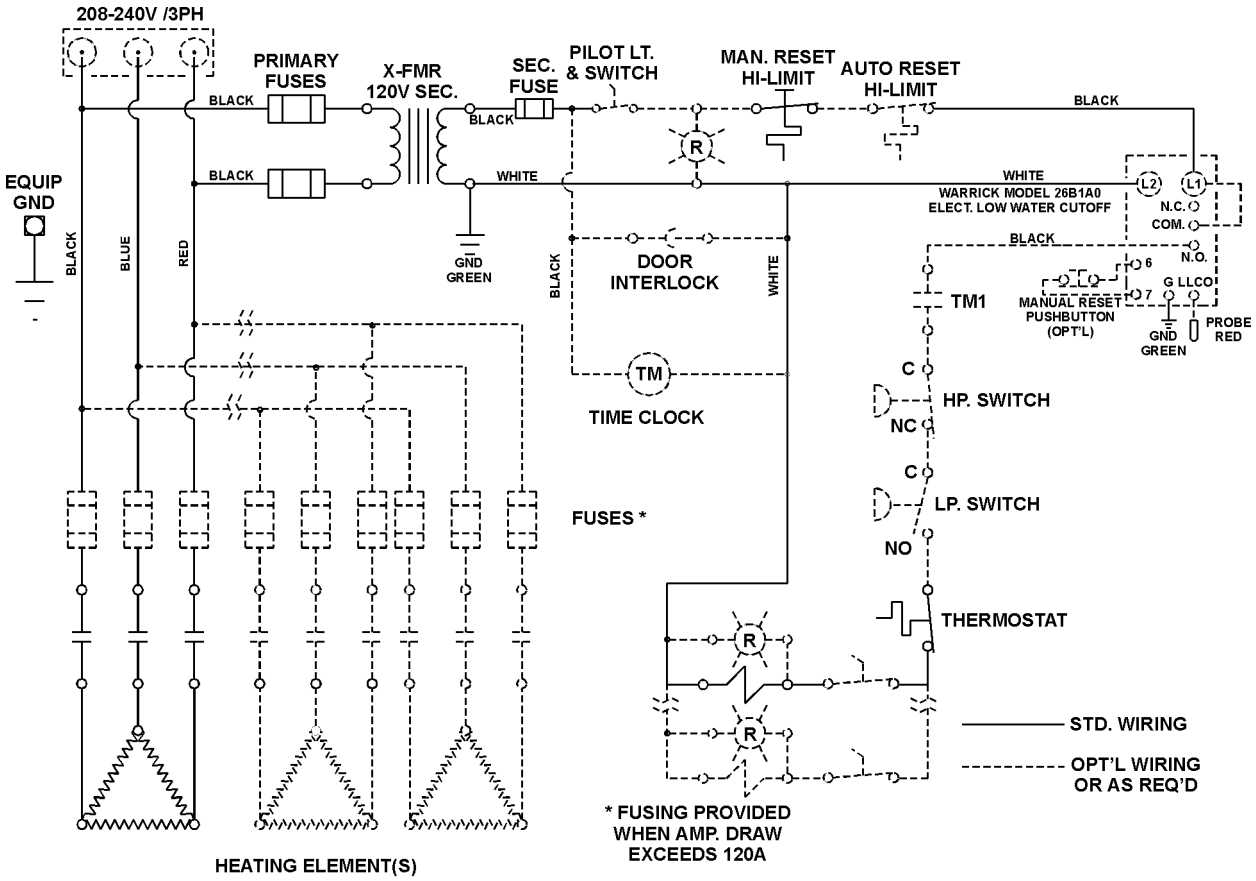
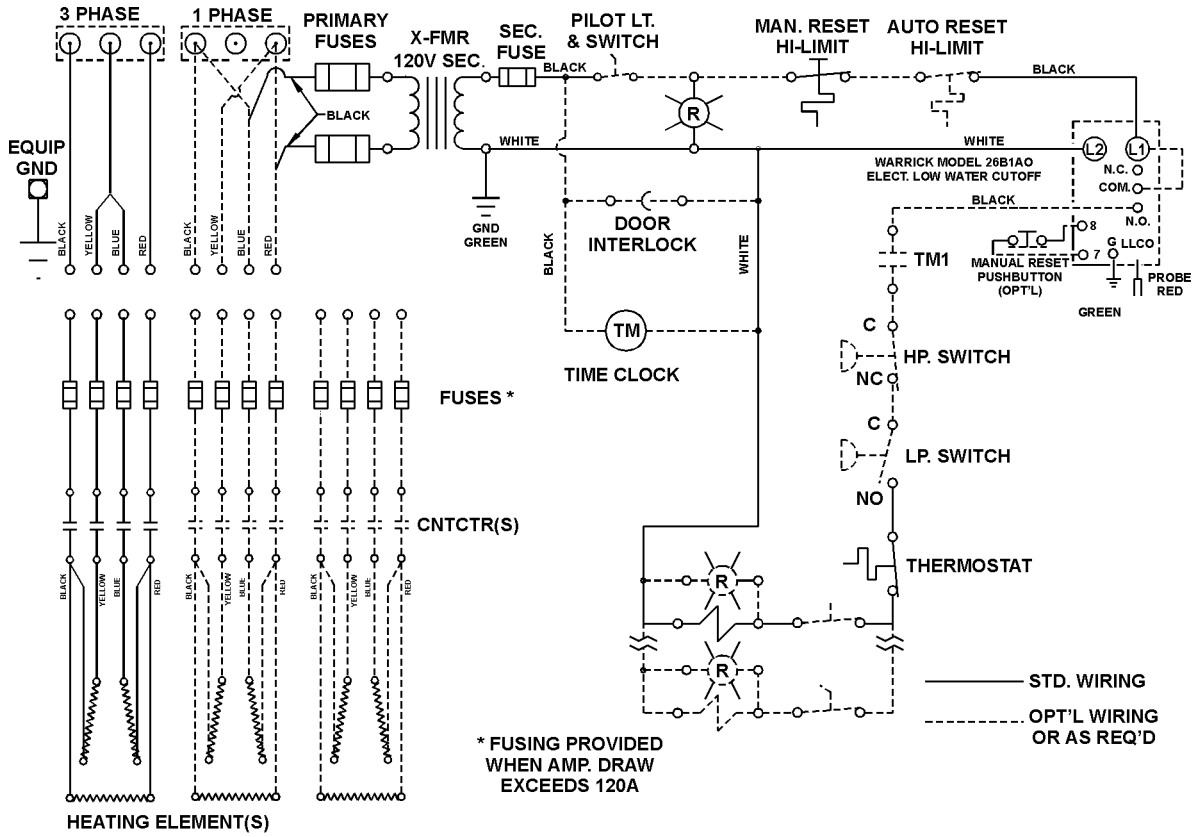


SMALL COMMERCIAL WIRE DIAGRAM
208-240V / 3PH



SMALL COMMERCIAL WIRE DIAGRAM
208-240V / 3-1PH

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3-1 PHASE CONVERSIONS

In the case where the unit is phase convertible and it has only one contactor, jumper wires (provided) must be added according to the phase of the supply voltage. See the diagram below. For single-phase connection, jumpers A-C and B-D must be added. For three-phase connection, jumper B-C must be added.

3-1 PHASE CONTACTOR JUMPER CONFIGURATION

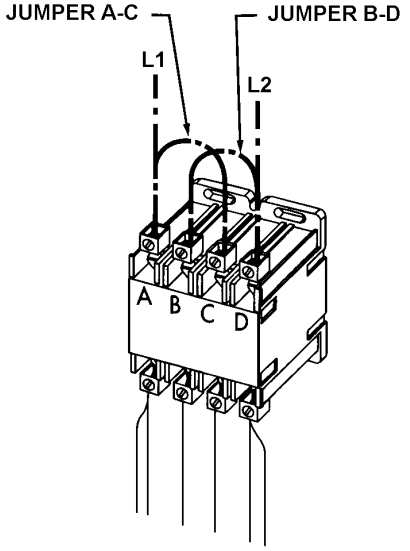


FIGURE 1
1 PHASE CONNECTION

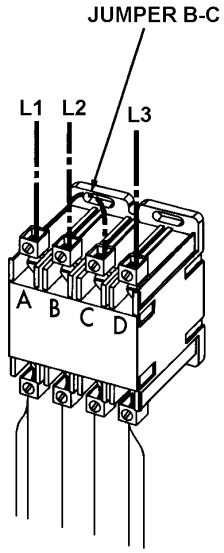
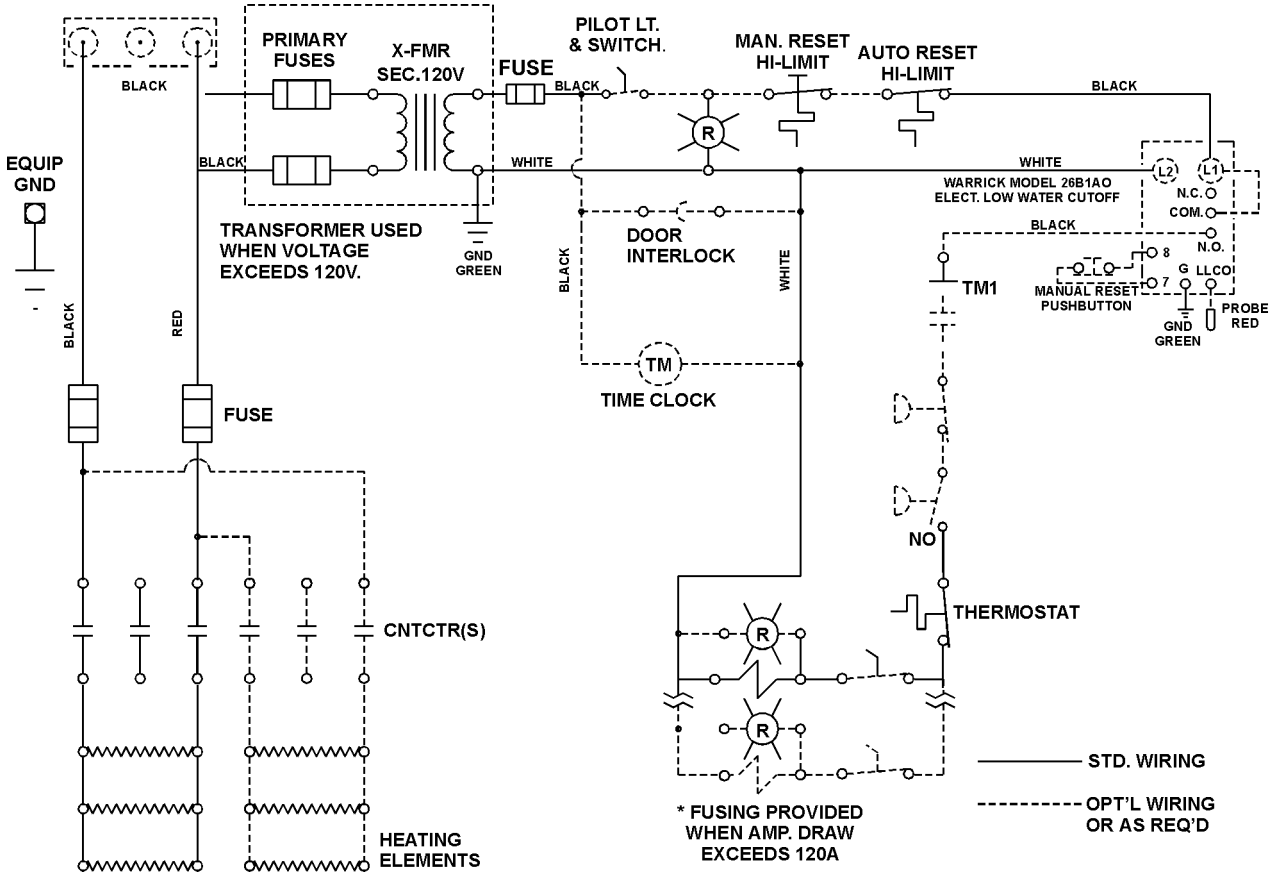


FIGURE 2
3 PHASE CONNECTION



SMALL COMMERCIAL WIRE DIAGRAM
300-600V / 3PH

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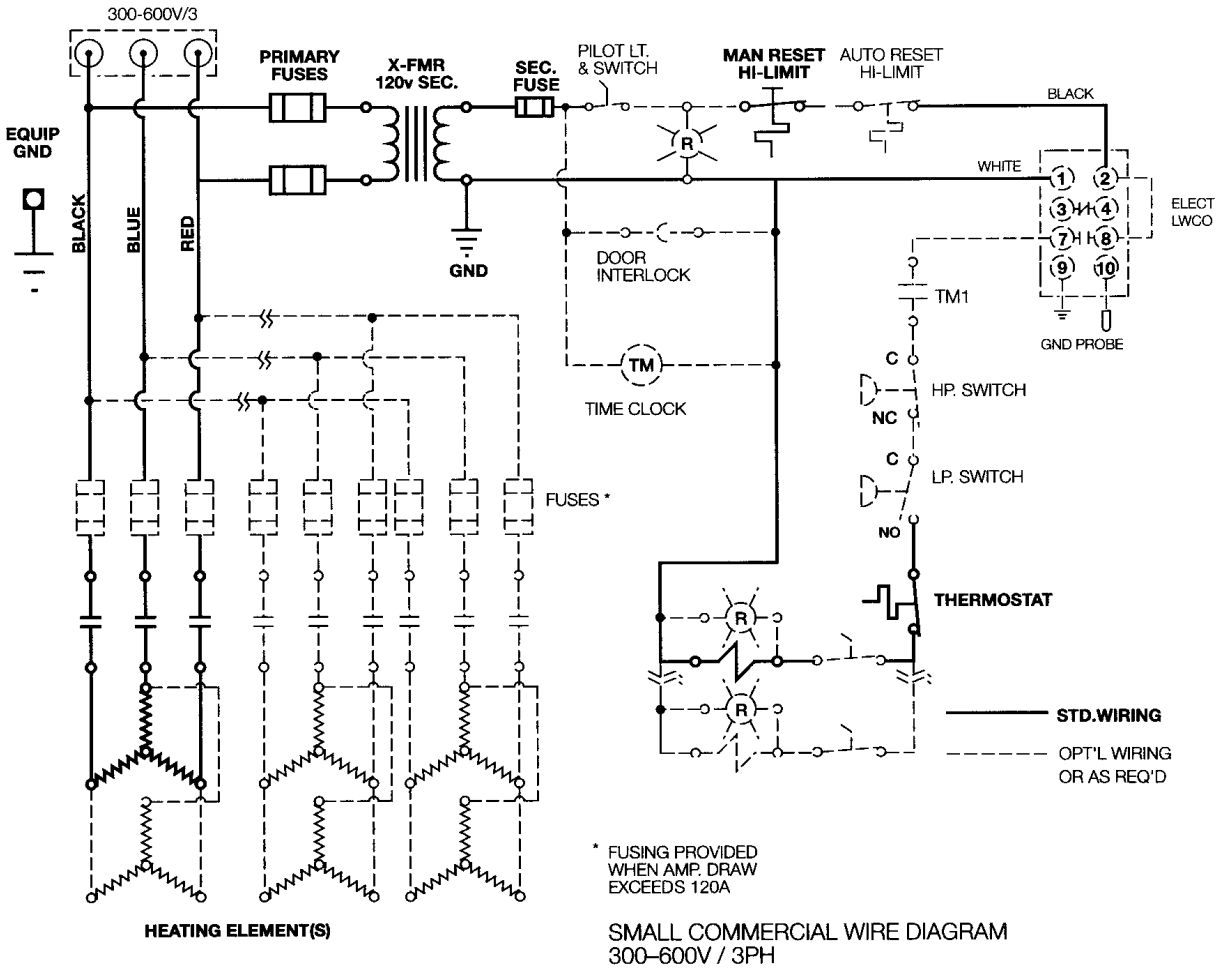
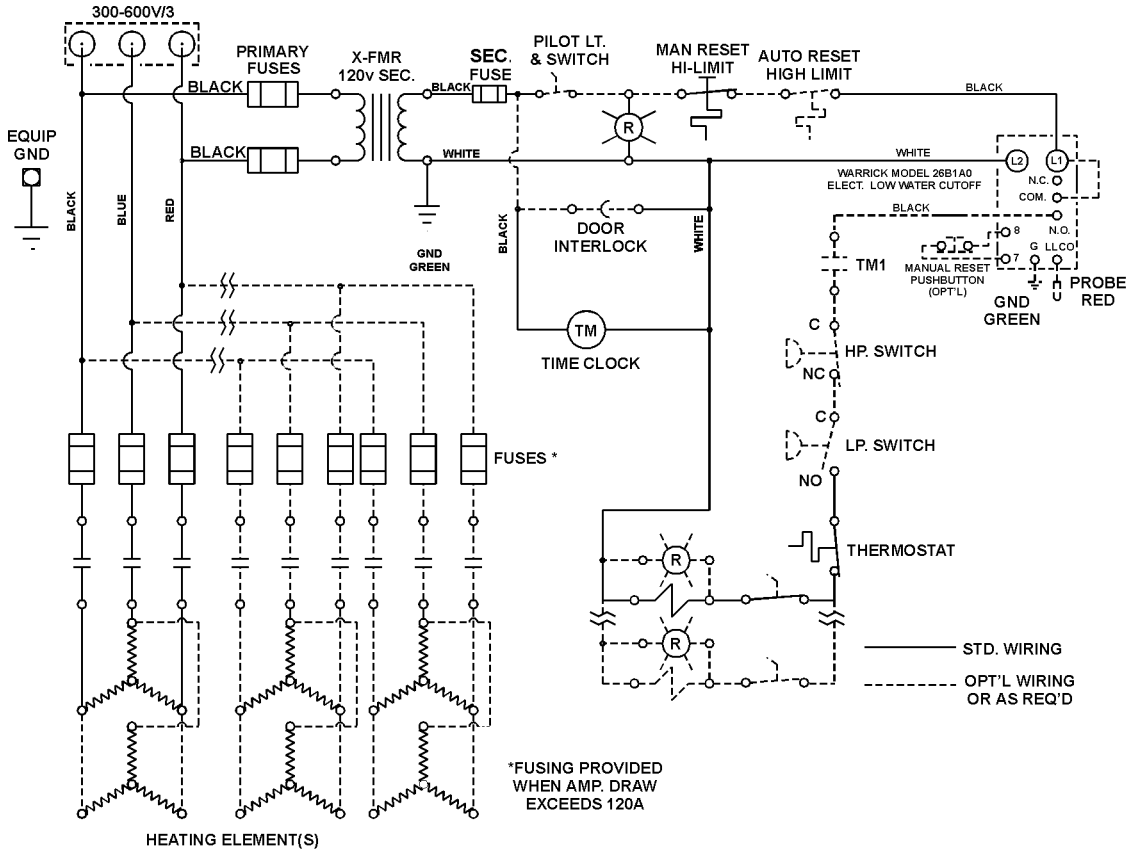


SMALL COMMERCIAL WIRE DIAGRAM
SINGLE PHASE



SMALL COMMERCIAL WIRE DIAGRAM
300-600V / 3PH

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OPERATION

GENERAL

Never operate the heating elements without being certain the water heater is filled with water, and a temperature and pressure relief valve is installed in the relief valve opening.

FILLING

1. Turn off the electrical disconnect switch.
2. Close the water heater drain valve by turning knob to right (clockwise).
3. Open a nearby hot water faucet to permit the air in the system to escape.
4. Fully open the cold water inlet valve allowing the heater and piping to be filled.
5. Close the hot water faucet as water starts to flow. The heater is now ready for START UP and TEMPERATURE REGULATION.

START UP

The following checks should be made by the installer when the heater is placed into operation for the first time.

1. Open the hinged access door, check all water and electrical connections for tightness. Also check connections on top and side of heater.
   - Repair water leaks and tighten electrical connections as necessary.
2. Depress red button on manual reset high limit switch.
3. Turn on the electrical disconnect switch.
4. Observe the operation of the electrical components during the first heating cycle. Use care as the electrical circuits are energized.
   - Thermostat and contactor operation should be checked by (a) manually operating thermostat and (b) allowing the heater to come up to temperature and shutoff automatically.

- The thermostat operates all contactor coils simultaneously.

5. Close the access door.

TEMPERATURE REGULATION

⚠ DANGER

THIS WATER HEATER IS EQUIPPED WITH AN ADJUSTABLE THERMOSTAT TO CONTROL WATER TEMPERATURE. HOT WATER TEMPERATURES REQUIRED FOR AUTOMATIC DISHWASHER AND LAUNDRY USE CAN CAUSE SCALD BURNS RESULTING IN SERIOUS PERSONAL INJURY AND/OR DEATH. THE TEMPERATURE AT WHICH INJURY OCCURS VARIES WITH THE PERSON'S AGE AND TIME OF EXPOSURE. THE SLOWER RESPONSE TIME OF DISABLED PERSONS INCREASES THE HAZARDS TO THEM. NEVER ALLOW SMALL CHILDREN TO A HOT WATER TAP, OR TO DRAW THEIR OWN BATH WATER. NEVER LEAVE A CHILD DISABLED PERSON UNATTENDED IN A BATHTUB OR SHOWER.

THE WATER HEATER SHOULD BE LOCATED IN AN AREA WHERE THE GENERAL PUBLIC DOES NOT HAVE ACCESS TO SET TEMPERATURES.

SETTING THE WATER HEATER TEMPERATURE AT 120°F WILL REDUCE THE RISK OF SCALDS. Some states require settings at specific lower temperatures.

Figure 1 shows the approximate time-to-burn relationship for normal adult skin.

Temperature Setting	Time to Produce 2nd & 3rd Degree Burns on Adult Skin
180°F (82°C)	Nearly instantaneous
170°F (77°C)	Nearly instantaneous
160°F (71°C)	About 1/2 second
150°F (65°C)	About 1-1/2 seconds
140°F (60°C)	Less than 5 seconds
130°F (54°C)	About 30 seconds
120°F (49°C)	More than 5 minutes

FIGURE 1

Valves for reducing point-of-use temperature by mixing cold and hot water are available. Also available are inexpensive devices that attach to faucets to limit hot water temperatures Contact a licensed plumber or the local plumbing authority.

The thermostat factory setting is 130°F. The dial is adjustable through a range of 95° to 194°.

The thermostat is behind the front access door. TURN OFF THE ELECTRICAL DISCONNECT SWITCH BEFORE OPENING DOOR.

- It is suggested the thermostat be turned to the lowest setting which satisfies the hot water requirements of the system. This helps minimize water scale formations on the heating elements.
- The thermostat contacts close on about 6°F (not adjustable) drop in water temperature.
- Where multiple thermostats are used, they may be all set at the same temperature or 2° to 4°F apart to achieve "step control". The bottom thermostat is set the hottest and top thermostat the coolest.

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Always close the front access door after making a temperature adjustment. Turn on electricity.

DRAINING

The water heater must be drained if it is to be shut down and exposed to freezing temperatures. Maintenance and service procedures may also require draining the heater.

1. Turn off the electrical disconnect switch.
2. Close the supply water inlet valve to heater.
3. Attach hose to outlet opening of drain valve and direct end to drain.
4. Open a nearby hot water faucet and the heater drain valve.
5. If the heater is being drained for extended shutdown, it is suggested the drain valve be left open during this period. The hose may be removed.

- Follow FILLING instructions when restoring hot water service.

MAINTENANCE

GENERAL

Periodically the drain valve should be opened and the water allowed to run until it flows clean. This will help to prevent sediment build-up in the tank bottom.

Periodically check the temperature and pressure relief valve to ensure that it is in operating condition. Lift the lever at the top of the valve several times until the valve seats properly and operates freely.

CAUTION

THE WATER PASSING OUT OF THE VALVE DURING THIS CHECKING OPERATION MAY BE EXTREMELY HOT.

Water heater maintenance includes periodic tank flushing and cleaning, and removal of lime scale from the heating elements.

Component	Operation	Interval	Required
Tank	Flushing	Monthly	----------
	Sediment Removal	As needed	----------
Elements	Lime Scale Removal	As needed	UN•Lime® delimer and element gaskets, Part No.5109.

Tank flushing should be performed in accordance with the above schedule. Tank sediment removal and element lime scale removal must be performed when needed as determined by periodic inspections. Following are the instructions for performing recommended maintenance.

FLUSHING

The water heater drain valve should be opened once a month to help prevent sediment buildup on the tank bottom.

1. Turn off the electrical disconnect switch.
2. Attach hose to outlet opening of drain valve and direct end to drain.
   - Open the drain valve by turning the knob to the left (counterclockwise). Allow water to flow until it runs clean.
   - If water does not flow from opened drain valve, follow instructions for sediment removal.
3. When finished flushing:
   - Close heater drain valve and remove hose.
   - Turn on electricity.

SEDIMENT REMOVAL

Water borne impurities consist of fine particles of soil and sand which settle out and form a layer of sediment on the bottom of the tank. In time, if not removed, the level of sediment might reach the heating elements and cause their failure.

For convenience, sediment removal and element lime scale removal should be performed at the same time as follows.

LIME SCALE REMOVAL

Lime scale accumulations on the heating elements is a normal condition, common to all immersion type elements. Factors which affect the amount of this formation are:

1. Amount of hot water used. As the volume of water heated increases, more scale results.
2. Water temperature. As the temperature of water is increased, more scale is deposited on the elements.
3. Characteristics of water supply. Regardless of water treatment, the elements should be examined regularly.

Lime scale accumulations may cause noises to occur during operation.

It is recommended that a heating element be removed periodically for examination. If it is scaled, all of the elements should be removed and cleaned. If the tank bottom has an accumulation of sediment it should be cleaned.

Lime scale should be removed by dissolving the accumulation in UN•LIME® delimer. UN•LIME is a non-muriatic delimer, available from A.O. Smith Water Products Company, Product Service Division, 5621 W. 115th ST., Alsip, IL. 60803. Do not use muriatic or hydrochloric acid base deliming solutions to remove lime scale from the elements.

1. Turn off electrical disconnect switch.
2. Drain the heater following DRAINING instructions.
3. Open front access door.
4. Disconnect the element wiring. Try not to disturb the wiring unnecessarily and reconnection will be easier.

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5. Remove the bolts from each element.

6. Remove the elements from the openings.

   - Use a twisting, pulling action to remove elements scaled beyond size of the tank openings.

   - Brush loose scale from elements.

7. Lime scale removal.

   - Place limed ends of heating elements into UN•LIME delimer and allow scale to dissolve. Do not permit delimer or water to contact heating element electrical terminals.

   Other scale removal:

   - Silicates, sulfates and aluminates must be removed by scraping or other mechanical means. Lime scale solvents will not remove these types of scale which are occasionally encountered.

8. Flush cleaned ends of elements with water when deliming or cleaning is completed.

9. Remove sediment and scale from the tank bottom through the access provided by the element opening(s).

   - The cold water inlet valve and drain valve may be opened to aid the cleanout process.

10. Clean remaining gasket material from tank and element flanges. DO not reuse original element gaskets.

    - The element gaskets should be replaced whenever an element is removed.

11. Put new gaskets on each element and install into tank openings.

    - Uniformly tighten element bolts.

12. Attach element wires to connection points from which they were removed.

13. Follow FILLING instruction to restore hot water service.

    - Check for water leaks around elements and proper operation when heater is filled.

    - Close front access door.

CHECKLIST

Before calling for service, check the following points to see if the cause of trouble can be identified and corrected. Reviewing this checklist may eliminate the need of a service call and quickly restore hot water service. Figure 1 identifies the location of all of the heater components.

BE SURE TO TURN OFF THE ELECTRICITY WHEN CHECKING EQUIPMENT.

Not enough or no hot water.

1. Be certain the electrical disconnect switch serving the water heater is in the ON position.

2. Check the fuses.

   - The electrical disconnect switch usually contains fuses.

3. If the water was excessively hot, and is now cold, the high limit switch may have operated.

   - To reset, remove the plug from the top cover of the heater and push the reset button.

   - Repeated operation of the high temperature cutoff should be investigated by your dealer.

4. The capacity of the heater may have been exceeded by a large demand for hot water.

   - Large demands require a recovery period to restore water temperature.

5. Cooler incoming water temperature will lengthen the time required to heat water to the desired temperature.

6. Look for hot water wastage and leakage.

7. Sediment or lime scale may be affecting water heater operation. Refer to page 18 for details.

Water is too hot

1. Refer to TEMPERATURE REGULATION.

Water heater makes sounds

1. Sediment or lime scale accumulations on the elements causes sizzling and hissing noises when the heater is operating.

   - The sounds are normal. However, the tank bottom ` and elements should be cleaned. Refer to page 18 for details.

2. Some of the electrical components of the water heater make sounds which are normal.

   - Contactors will “click” or snap as the heater starts and stops.

   - Contactors often hum.

Water leakage is suspected.

1. Check to see if the heater drain valve is tightly closed

2. If the outlet of the relief valve is leaking it may represent:

   - Excessive water temperature.

   - Faulty relief valve.

   - Excessive water pressure.

   - Excessive water pressure is the most common cause of relief valve leakage. It is often caused by a “closed system”. A check valve in the inlet system will not permit the expanded hot water volume to equalize pressure with the main. A relief valve must release this water or the water heater or plumbing system will be damaged.

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When such a condition is encountered, local codes or inspection agency should be consulted to determine which system is acceptable in your area. These may consist of:

- Installation of a second relief valve set to lower than the primary safety relief valve.
- An expansion tank of suitable pressure and provision to avoid water logging.
- Removal of the check valve.

4. Examine the flange area of the elements for gasket leakage.
   - Tighten the bolts or, if necessary, follow the WATER AND LIME SCALE REMOVAL procedure to replace the gaskets.
   - Refer to “LEAKAGE CHECKPOINTS” on page 22.

IF YOU CANNOT IDENTIFY OR CORRECT THE SOURCE OF MALFUNCTION

1. Place the water heater electrical switch in the OFF position
2. Close the supply water inlet valve to the heater.
3. Contact your dealer.

REPLACEMENT PARTS

Replacement parts may be ordered through dealers, authorized servicers or distributors. Refer to Yellow Pages for where to call or contact the A.O. Smith Water Products Company, Product Service Division, 5621 W. 115th Street, Alsip, IL 60803, 1-800-433-2545 When ordering parts, specify complete model no., serial no., (see rating plate), quantity and name of part desired. Standard hardware items should be purchased locally.

REPLACEMENT PARTS

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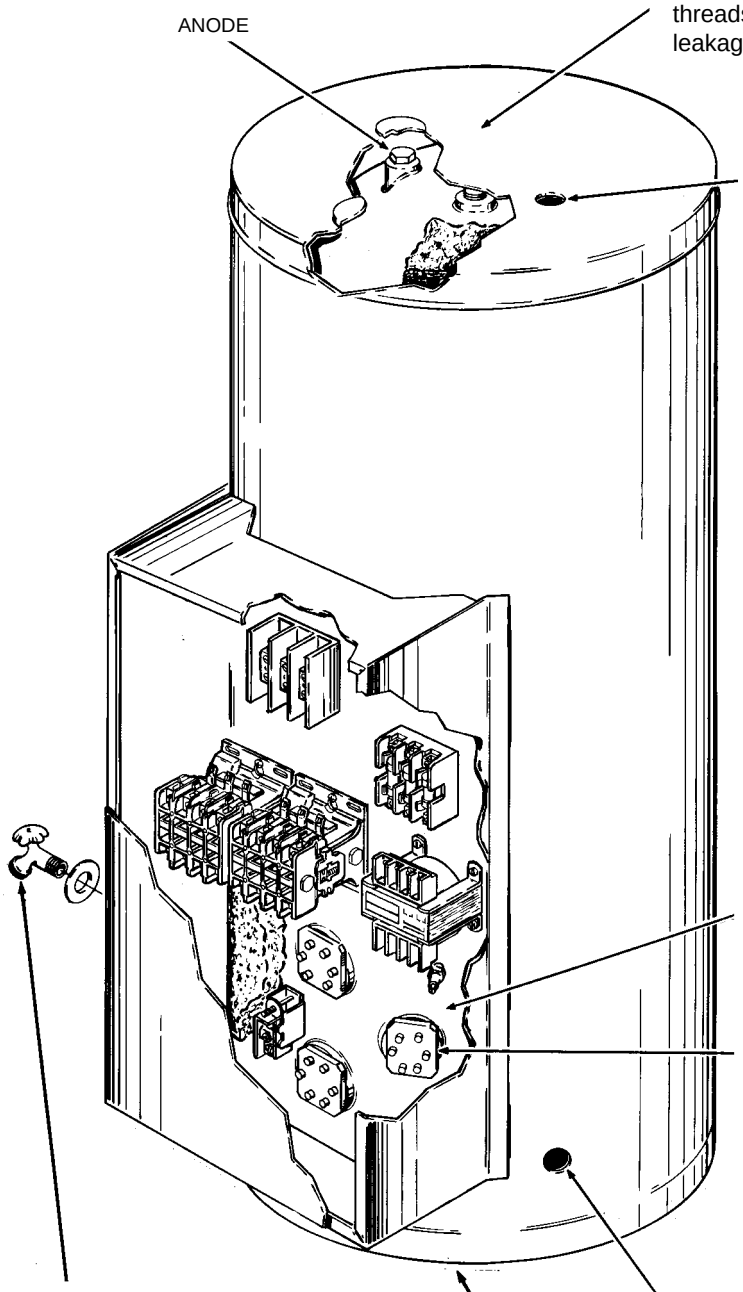
LEAKAGE CHECKPOINTS

INSTRUCTIONS: USE THIS ILLUSTRATION AS A GUIDE WHEN CHECKING FOR SOURCES OF WATER LEAKAGE. YOU OR YOUR DEALER MAY BE ABLE TO CORRECT WHAT APPEARS TO BE A PROBLEM.



Where possible, remove or lift top cover to examine threads of fittings installed into tank for evidence of leakage. Correct fitting leaks as necessary.

Relief valve operation and leakage may be due to water expansion during heating cycle or foreign material on seat of valve. If the valve is not piped to an open drain the released water could be mistaken for a leaking heater. To check where threaded portion enters tank, insert Q-tip or similar absorbent material between jacket opening and valve to swab spud area. Remove valve* if leak is indicated and repair with pipe joint compound.

Water on side of the tank may be condensation due to the panel or insulation not being in place.

Water leaks at the elements may be due to:

1. Defective element which leaks at terminals or through flange. Replace element*.

2. Loose element/gasket leak:

   Flange type: Tighten screws with wrench. If leak continues remove element* and discard gasket. Clean gasket seating areas and reinstall element with new gasket.

   NOTE: Part No. 5288 scale cleaning replacement screws available where threads have become rusted or damaged, preventing tightening.

Drain valve leakage could be from the valve itself. Either correct the problem or replace the valve.* To check for leakage where threaded portion enters tank, insert Q-tip or similar absorbent material between jacket opening and valve to swab spud area. Remove valve* if leak is indicated and repair with pipe joint compound.

*Contact your dealer as it is necessary to shut off electricity and drain tank to perform procedure.

Condensation and dripping may appear on pipes when cold water temperature is low. Pipe fitting may be leaking.

All water which appears at the heater bottom or on the surrounding floor may be caused by condensation, loose connections or relief valve operation and leakage. Do not replace the heater until a full inspection of all potential leak points is made and corrective steps taken to stop the leak. Leakage from other appliances, water lines or ground seepage should also be suspected until proven otherwise.

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MODEL DSE LIMITED WARRANTY

A.O. Smith Corporation, the warrantor, extends the following **LIMITED WARRANTY** to the owner of this water heater:

1. THE TANK

If the glass-lined tank in this water heater shall prove upon examination by the warrantor to have leaked due to natural corrosion from potable water therein, during the first THREE years after initial installation, the warrantor will supply a complete new A.O. Smith water heater of equivalent size and current model. Some government agencies are requiring energy efficient standards for water heaters. In the event regulations prohibit sale of a model of equivalent size and construction, A.O. Smith will provide a model which complies with the regulations of your area, in which case the consumer will be charged the difference in price between the like replacement and the energy efficient model required. The warranty on the replacement water heater will be limited to the unexpired term of the original warranty.

2. ALL OTHER PARTS

If within ONE year after initial installation of this water heater, any part or portion shall prove upon examination by the warrantor to be defective in material or workmanship, the warrantor will repair or replace such part or portion at its option.

3. CONDITIONS AND EXCEPTIONS

This warranty shall apply only when the water heater is installed in accordance with local plumbing and building codes, ordinances and regulations, the printed instructions provided with it and good industry practices. In addition, a temperature and pressure relief valve, certified by A.G.A. and approved by the American Society of Mechanical Engineers, must have been installed.

a. This warranty shall apply only when the heater is used:
   (1) at temperatures not exceeding the maximum setting of its thermostat;
   (2) at water pressure not exceeding the working pressure shown on the water heater;
   (3) when operated free from the damaging effects of uncontrolled water hammer;
   (4) when filled with potable water, free to circulate at all times;
   (5) in a non-corrosive and non-contaminated atmosphere;
   (6) with factory approved anode(s) installed;
   (7) in the United States, its territories or possessions, and Canada.

b. Any accident to the water heater, any misuse, abuse (including freezing) or alteration of it, any operation of it in a modified form, any use of insulation blankets, or any attempt to repair tank leaks will void this warranty.

c. This warranty is void if a device acting as a backflow prevention device (check valves etc) is installed in the cold water supply the heater is connected to, unless an effective method of controlling thermal expansion is also installed at the heater(s) and operational at all times. The relief valve installed on the heater is not an acceptable method.

4. SERVICE AND REPAIR EXPENSES

Under the limited warranty the warrantor will provide only a replacement water heater or part thereof. The owner is responsible for all other costs. Such costs may include but are not limited to:

a. Labor charges for service removal, repair or reinstallation of the water heater or any component part;

b. Shipping, delivery, handling, and administrative charges for forwarding the new heater or replacement part from the nearest distributor and returning the claimed defective heater or part to such distributor.

c. All cost necessary or incidental for any material and/or permits required for installation of the replacement heater or part.

5. LIMITATIONS ON IMPLIED WARRANTIES

Implied warranties, including the warranty of merchantability imposed on the sale of this heater under state law are limited to (1) year duration for the heater or any of its parts. Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you.

6. CLAIM PROCEDURE

Any claim under the warranty should be initiated with the dealer who sold the heater, or with any other dealer handling the warrantor's products. If this is not practicable, the owner should contact:

U.S. Customers
A.O. Smith Water Products Company
5621 W. 115th Street
Alsip, IL 60803
Telephone: 800-323-2636

Canadian Customers
A.O.Smith Enterprises Ltd.
P.O.Box 310 - 768 Erie Street
Stratford, Ontario N5A 6T3
Telephone: (519) 271-5800

a. The warrantor will only honor replacement with identical or similar water heater or parts thereof which are manufactured or distributed by the warrantor.

b. Dealer replacements are made subject to in-warranty validation by warrantor.

7. DISCLAIMERS

NO OTHER EXPRESS WARRANTY HAS BEEN OR WILL BE MADE IN BEHALF OF THE WARRANTOR WITH RESPECT TO THE HEATER OR THE INSTALLATION OPERATION REPAIR OR REPLACEMENT OF THE HEATER. THE WARRANTOR SHALL NOT BE RESPONSIBLE FOR WATER DAMAGE, LOSS OF USE OF THE UNIT, INCONVENIENCE, LOSS OF DAMAGE TO PERSONAL PROPERTY OR OTHER CONSEQUENTIAL DAMAGE. THE WARRANTOR SHALL NOT BE LIABLE BY VIRTUE OF THIS WARRANTY OR OTHERWISE FOR DAMAGE TO ANY PERSONS OR PROPERTY, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT OR IN TORT.

a. Some states do not allow the exclusion or limitation of incidental or consequential damage, so the above limitations or exclusions may not apply to you.

b. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Fill in the following for your own reference. Keep it. Registration is not a condition of warranty. The model and serial number are found on the heater's rating plate.

Model No. _____ Serial No. _____ Date Installed _____

Dealer's Name _____

Dealer's Address _____ Phone No. _____

City and State _____ Zip Code _____

KEEP THIS WARRANTY AND MANUAL POSTED ADJACENT TO THE HEATER FOR FUTURE REFERENCE WHENEVER MAINTENANCE, ADJUSTMENT OR SERVICE IS REQUIRED.

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REPLACEMENT PARTS

A.O. SMITH
WATER PRODUCTS COMPANY

5621 W. 115TH STREET, ALSIP, IL 60803
Phone: 800-433-2545 Fax: 800-433-2515
www.hotwater.com E-Mail: parts@hotwater.com

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